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CHARLES GILL: THE FIRST ACTUARY IN AMERICA

EMORY McCLINTOCK

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Vol. XIV, Part I, No. 49.]

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CHARLES GILL: THE FIRST ACTUARY IN AMERICA.

BY

EMORY MCCLINTOCK.

At the last (October, 1912) meeting of the Actuarial Society of America, at which I was unable to be present, I took occasion to express in writing my surprise that so very little seemed to be known of the life and personality of Charles Gill, the first Actuary of the Mutual Life Insurance Company of New York, which is accustomed to reckon itself the earliest in the country in date of establishment. In saying this I would not throw doubt upon its claim to priority, which I have myself always upheld. I have taken the first opportunity to seek out and present such facts as I could find on the subject of Charles Gill.

LIFE IN ENGLAND.

Charles Gill was born at Staxton, in Yorkshire, England, according to a certificate which I recently procured from the Rev. Robert A. White, the vicar of the parish church at Willerby in England. The certificate is as follows:

"Baptisms from Lady Day, 1805, to Lady Day, 1806.

"No. 73rd. Oct. 22nd., A. D. 1805, Charles, son of David and Ann Gill of Staxton, shoemaker."

The first life policy in the Mutual Life on Mr. Gill was paid on November 26, 1855, a date which came as nearly as possible fifty years from his birth. It was issued for $2,000 on the 12th of March, 1850, in favor of his wife, Eliza E. Gill. Another policy was issued exactly two years later, March 12, 1852. This was paid on the same day as the first to his three children. Their names were Eliza Anne Gill, William C. Gill, and Mary Gill. The amount of this second policy was $3,000. The date of Mr. Gill's birth was stated by himself, in his first application, as 22 October, 1805. As his evidence is not exact, the date being the same as the day of his baptism, as may be seen from the preceding certificate, it is to be presumed that about three days intervened between his birth and his baptism, in which case he must have been born three days, or

more, before 22 Oct., 1805. The account books of the Mutual Life give the date of his death as being his fiftieth birthday. Walford's Cyclopædia (Insurance) states his death to have been on the same date, but apparently through a misprint states he was "aged 51." The same date is also given in a memoir of him, appearing in the *Journal of the Institute of Actuaries,* 1856, pp. 216–227. But the mortuary record of the Mutual Life, which is the best official record of his death, makes it as occurring on 26 Oct., 1855. It seems established in any case, that he lived half a century.

There are several sources from which a few facts can be gathered about his early life, and his subsequent career in America. The president of the Mutual Life, Frederick S. Winston, contributed some of these, and a warm friend of Gill's wrote at much greater length, namely, the Rev. W. A. Muhlenberg, D.D., the noted president of St. Paul's College at Flushing, where Gill had the mathematical chair during several years. Both writers aided the editor of the *United States Insurance Gazette* in publishing such facts as lay in their power, with the result of providing a biographical sketch of considerable value, which was at one time copied by the *Assurance Magazine* (*J. I. A.*) of London, which has already been referred to. Both writers will be drawn upon here.

Winston says of his early life: "he left his village school at ten years of age, his schoolmaster declaring that he knew as much as he did. After this all his knowledge was procured by his own unaided exertions."

Dr. Muhlenberg's statement is more complete: "It appears from the testimony of his daughter, that her father was born Oct. 22, 1805, in a small, secluded country village, in the midland county of Yorkshire, England. Although the name of the village is not given, still we can form some idea of its obscurity and lack of educational institutions from the fact that it had neither 'school, library, nor literary society, not even the advantage of a resident clergyman'; consequently, he had none of those auxiliary helps and material assistances which we are accustomed to consider as indispensable to the acquisition of a sound practical education."

The village in question lies in the parish of Willerby, close to the sea coast, in the East Riding of Yorkshire. It is a few miles from Scarborough, which has grown within the last forty or fifty years from a small fishing town to a large and important watering place for tourists. Staxton was a small and straggling wayside village,

and the local shoemaker may have been a prominent personage in his way.

"The history of his youth, therefore, may be considered as forming another example of the noble illustrations which are upon record, of the successful 'pursuit of knowledge under difficulties.' Unfavorable and adverse as the circumstances were in which he was placed, yet he seems at a very early period to have had a glimmering presentiment or cheering presage that he would one day be a scholar and mathematician."

"At the age of thirteen he went to sea, and made a voyage to the West Indies; and, in scarcely three years afterwards, we find him aboard of a small vessel, where the captain and officers had been carried off by yellow fever, taking the command; and, from his knowledge of mathematics as applied to navigation, he brings the ship safely into port. At the age of sixteen he recommenced a vigorous course of self-training; at the same time he began to teach—the day being devoted to school duties, while his evenings were dedicated to the study of mathematics and general literature. Thus he was occupied for seven or eight long years, during which period he began to contribute to several mathematical journals and periodicals, and through them he ultimately became known to men of science."

Life in America.

After about twenty-five years in England, "where his life had been one continual struggle through years of trial, privation and toil," he came to New York, in 1830, doubtless in the company of his wife, because the date of his marriage is not known. It is stated that he at once began teaching in that city, and afterwards taught in Staten Island. "Soon after this he was appointed Professor of Mathematics and Natural Philosophy at Flushing Institute." This noteworthy school was under the care of a distinguished man already mentioned, the Rev. Dr. Muhlenberg, who expanded the school into a college, which took the name of St. Paul's. The college, after a course of some prosperity, and great earnestness among the students, amounting to positive enthusiasm, was finally given up, Muhlenberg entering on a life which was equally useful with that of a scholar, but which suited his genius better, that of a rector of a city church. In this work he continued till his death many years after. He was particularly noted for the catholicity of his sentiments. My own father, who was a New York minister

of another denomination, was a warm admirer of his, and never wavered in his strong affection for this large-hearted man. One thing that he did, among others, was the founding of St. Luke's Hospital. If he undertook any task, he entered into it with vigor and pertinacity, the deepest thing in his nature being earnestness. He was in fact by inheritance a kind of mystic. His biography, which I had not read until I looked it up in search of facts concerning Gill, and which does full justice to his memory, unfortunately does not mention Gill. The latter must have found his life at St. Paul's College entirely congenial. It had been, of course, a great change from a precarious existence among minor places in schools, and the companionship of such a man as Muhlenberg, and of the sort of men that he gathered about him, must have formed an oasis in his life. Flushing was a charming spot. College Point, as the site of the buildings came to be called, was a beautiful part of the village, sufficiently retired to be the home of scholars, and the main building was one of much architectural merit, though only built of wood. I remember it well, though I saw it only once, sixty years ago. Both Muhlenberg and Gill had gone elsewhere, the college having given place to an institute once more. In 1852 it had been bought by a friend of my father's, whose son's acquaintance was made by me that day, ending in a lifelong friendship. The boy became famous as R. W. Gilder, the poet and editor, whose youth was passed amid such surroundings.

The precise date when Gill joined the small body which formed the faculty of the college is not known, but from the fact given by Dr. Muhlenberg, that he had been employed on Staten Island, after work in a school in Westchester, it was probably as late as 1832. The next statement about Mr. Gill which has been repeatedly copied, is that "in 1836 appeared the first number of the *Mathematical Miscellany.*" This was a magazine which continued until 1839, and to which Gill gave an immense amount of hard work.

The Mathematical Miscellany.

The first step was taken in the new enterprise by the announced issue of a first number, preceded by a short "advertisement." This was as follows:

"This first number is an experiment. Its character and claims will be better explained by giving a specimen than a promise. The high estimate in which such works are held by European mathe-

maticians, and the fact of the great improvement in analysis, and that elegant problems in print appeared in this form are due to the discussions and investigations which they are calculated to bring forward," etc.,—in short, a laborious and diffuse attempt to explain something which was at first said to need no explanation. It went on to say that the names alone, if given, would be a guaranty of respectability on the part of those who have given assurance of support to the publication. Gill had, in fact, given much labor to the necessary preliminary correspondence, and there were certainly enough helpers in the field.

The main object of the publication was partly concealed until after the second number appeared. From this time forward special prominence was given to the presentation of problems, stating the time in which answers would be received, and then giving subsequently the names of those who answered, much as is now done in some publications devoted to young people. Emulation was plainly and forcibly appealed to. The time was ripe for such an enterprise. In this first number, it was announced that twenty new questions would be asked, which were accordingly stated on page 53. Answers would be accepted before August 1, 1836, and the next number would be issued on October 1, 1836. (The first number was apparently issued on March 1, 1836.)

The second number was obviously awaited with impatience by those interested. The following names are given among those of the contributors who are said to have answered the whole of the twenty questions satisfactorily: Professor Avery, of Hamilton College; Professor Catlin, of the same; Oren Root, of the same; Professor Theodore Strong, of Rutgers College. G. R. Perkins, of the Liberal Institute, Clinton, and others are mentioned as having answered some of the questions; and among the names given is the great name of B. Peirce, of Harvard University. There was also announced the promotion of a "Junior Department" composed of students only, which would in future add to the interest. Less abstruse questions were to be asked of the juniors. In the second number were given fifteen questions, to be answered by March 1, 1837. The third number would be issued two months later.

The third number contained, as answering all the fifteen questions, Avery, Catlin, Peirce, Root, Strong. These five could be relied upon, evidently. For the next number, the fourth, there were fifteen questions propounded, as well as in the third number,

to be answered by February 1, 1838. And the same five names appeared in the fourth number.

The same five names were repeated in the fifth number.

In the sixth number, answering all of the fifteen questions previously proposed, these names appeared: Avery, Catlin, Root, Strong. In the seventh number the names were Avery, Catlin, Peirce, Perkins, Strong.

The competition ended in the last (eighth) number of the "*Mathematical Miscellany,*" the same names appearing as in the seventh. No public notice was given of the stoppage.

In giving this brief summary of the chief gladiators in this contest for superiority, it must not be forgotten that many names appeared of those who answered some though not all of the questions. There were among those who were able to answer all of the questions, three of the five who are noted above as reliable. Of the five, Professor Peirce was one who did not continue throughout; and the other was a man of brilliant genius, Oren Root, of Clinton, N. Y. (father of the present United States Senator from his native state). Mr. Root, the father, was subsequently professor at the same college, Hamilton.

Returning to the second number, it contained a list of supporters which justified Gill's rosy anticipations. The two who gave their names for the largest amount were, "Rev. W. A. Muhlenberg, D.D., Principal of St. Paul's, $50 per annum," and "C. Gill, Professor of Mathematics, $20 per annum." The others follow:

L. Van Bokkelen, Mathematical Instructor	$10	per annum.
G. B. Docharty, Mathematical Instructor	10	" "
Professor C. Avery, Hamilton College, Clinton	15	" "
Professor M. Catlin, Hamilton College, Clinton	10	" "
O. Root, Mathematical Tutor, Hamilton College, Clinton	10	" "
G. R. Perkins, Liberal Institute, Clinton	5	" "
William Lenhart, Esq., York, Penna.	10	" "
J. F. Macully, Esq., New York	5	" "
Evans Hollis, Esq., Rye, N. Y.	5	" "

At the same time the price of subscription was fixed at $2 per annum.

It may be suspected that the subscription list itself was not very much larger. Professors Peirce and Strong are probably the only ones known to be on the list of subscribers in addition to the first contributors of money.

The names of Avery and Catlin, professors of mathematics at Hamilton, are on every list; and that of Theodore Strong completed the trio which was on each published statement of those who answered every question. Avery was perhaps the eldest of the triumvirate, which might have been called the invincible three. Catlin was equally certain to solve any problem which presented itself, and a sister of the third member of the three, Strong, is stated to have been married to Avery. I take this item of personal news from a pamphlet publication of the National Academy of Sciences, dated in 1879 from Washington: "A Memoir of Theodore Strong, LL.D.," by no less a person than that veteran ex-actuary, Joseph P. Bradley, of the Supreme Court of the United States.

Bradley's testimony to Strong's transcendent merit as a mathematician is very convincing. The history of his life is easily stated. Born in South Hadley, perhaps the same as the present Amherst, in 1790, he was graduated at Yale in 1812, where he had taken the prize in mathematics, and was at once chosen by President Backus, called by Bradley "a man of brilliant parts," as tutor in Hamilton College. He remained tutor for four years, followed by eleven others as professor of mathematics, retiring in 1827 to take the same chair in Rutgers College, New Brunswick, N. J. The journey there took four days. In 1859 he relinquished active work, to become in 1863 one of the earliest members of the National Academy of Sciences. He died in 1869, leaving a name practically unsurpassed in his part of this country, as is stated by Cajori in a note to his "History of Mathematics." Bradley's judgment is that "in his day he had hardly a peer in grasp and power of intellect," and that "his ability was so generally recognized at the period of his settlement in New Jersey that a prominent mathematician of New York, who, about that time, published a series of difficult problems which he challenged all the mathematicians in America to solve, expressly excepted Dr. Bowditch, Professor Strong, and one other." Bradley closes his memoir with a sentence which I am tempted to quote: "It is right that we should honor him in our memories and not neglect to speak his praise."

The invincible triumvirate of mathematicians furnished by Hamilton College are together so exceedingly noteworthy that I may say of Dr. Azel Backus, its president, that he had a good nose for youthful genius when choosing his staff of professors. Strong,

Avery and Catlin, followed by Root, formed a galaxy of unapproached talent.

Close of the First Paper.

I am so overwhelmed with the unexpected wealth of the material that I have gathered together that the space which I had expected to occupy, in placing before the society some record of the life and doings of Charles Gill, has been filled, and I must therefore defer the continuation of the story till the next meeting. The issue of the *Mathematical Miscellany* was only the beginning of his active work in America. The chief object of that work has already been indicated, although it was not clearly stated to the public. Many papers on mathematics will be mentioned, of which he himself was a large contributor, although the apparently ubiquitous personality of Theodore Strong may be responsible for much. (Judge Bradley counts twenty-two contributions of Strong's to the *Miscellany,* though only eight numbers in all were published.) In 1855 Gill's laborious and useful life was prematurely ended. I shall later quote from Muhlenberg's eulogy of his worth as a man, and I can sincerely say that my own judgment of his character is exceedingly high.

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per L. A. Joffe.

Charles Gill; the First Actuary in America.

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EMORY McCLINTOCK.

Reprinted from Transactions of the Actuarial Society of America, Vol. XIV, Part II.
No. 50. October 23rd and 24th, 1913.

C. C. Williamson.

CHARLES GILL; THE FIRST ACTUARY IN AMERICA.

[Reprinted from the TRANSACTIONS OF THE ACTUARIAL SOCIETY OF AMERICA,
Vol. XIV, Part II, No. 50.]

CHARLES GILL; THE FIRST ACTUARY IN AMERICA.

(SECOND PAPER.)

BY

EMORY MCCLINTOCK.

Some further facts concerning Gill's life in England have come to light recently which I owe to the care of my friend, Mr. S. A. Joffe, the author of several papers on subjects connected more or less with the work of Mr. Gill.

After the May meeting, I wrote Mr. Joffe for copies of Gill's manuscripts from the office of the Mutual Life, as well as for anything else about Gill which might be in his power to give me. He at once replied that he had noticed Gill's name in some numbers of the *Ladies' Diary,* as having solved problems in the years 1823–30; namely, in 1823–24 dated from "Ganton, near Scarbro"; in 1826–27 dated "Hessle, near Hull," and in 1829–30 dated from "Seamer, near Scarboro." Afterwards, when I had the pleasure of a visit from him during his vacation, I remarked that the application indexes of the Mutual Life might profitably be consulted for further clues about Gill, as we had the names of his children. On his return, he sent me copies of two applications of Eliza Anne Gill from which the dates of birth were found or inferred as follows: Mrs. Eliza E. Gill, 1805; Eliza Anne Gill, October 3, 1828, and Wm. C. Gill, 1842. It appears that the youngest daughter, Mary Gill, died very soon after her father of smallpox, and that the other children, first named, may possibly be still living in advanced life.

These few facts, with some others, as data, and some slight help from the imagination will be found to give a greatly extended idea of his early life, although I am not much in the habit of drawing on my imagination in the endeavor to fill out the gaps in my data. Seamer and Ganton may be taken first. They are townships on the high road south from Scarborough, one on each side of Staxton, Gill's birthplace. Seamer is about four miles southwest of Scarborough, and Staxton is two miles farther south. The road not being very straight, Ganton is about three miles further from Scarborough, westerly from Staxton. Gill was only seventeen when

he taught school first at Ganton, and this was his start in life as a mathematician.

Ganton.

To get one's name in the *Ladies' Diary* for 1823, one had to buy or borrow a copy of the *Diary* for 1822, this publication being issued only once a year, presumably on January 1. As Gill was born on or after October 20, 1805, he must have been a teacher at Ganton before October 20, 1822, when he was seventeen years of age. The Staxton school must have been good for little, or even good for nothing. It was probably a part of the religious outfit of the parish of Willerby, Staxton being two or three miles from the church, and the school may have been located nearer the church. There was, at that time, no regular system for teaching the children of any parish, the school being usually one of the benevolent duties of the parish priest, or minister, as he was usually called at that pre-Puseyite period. There was also a Wesleyan chapel at Staxton, and Gill might have been brought up, as a child, either in church or chapel, but the presumption is that he was a churchman. He is represented by Dr. Muhlenberg to have been, throughout his life, deeply religious.

The finding of employment, for the first time, was a thing of difficulty to this boy of sixteen. He had just returned from his dangerous trip to the West Indies, and may be considered a real hero in being able to assume the command of the vessel at a time when the officers had all died from pestilence. (It will be recollected that when he was thirteen, he took a place as an able seaman, which may be interpreted as running away from home: he was said to have learned what he could from the teacher at Staxton at ten years of age.) It was a critical time in his life. Turned loose on the world at that age, with such surroundings, the "making of a spoon" might readily enough have turned out to be the "spoiling of a horn." No word is heard in any quarter about his father, nor of his mother. His silence about his parents is remarkable.

How did he come to be employed in the parish school of Ganton, near by, at the age of sixteen? Character he certainly had, and hardships could only have served to bring out the stuff that was in him. What character had he? Two points, each great in itself. One was a self-reliance that was his Yorkshire birthright (I who write this know what that means, for I spent three years and more in that same county of York and know what the sturdy spirit of self-

dependence is, which is born in every Yorkshireman); the other was his extreme ambition. These traits, with the great foundation of religion, were the chief characteristics of Charles Gill. But character alone was not enough. Who recommended him? Certainly his appointment could not have come from any powerful influence exercised by his old teacher at Staxton, who might have given him a good word, but little more.

Of course, he went about among his friends and neighbors, and may have spent some time in doing so. The nearest man who could have helped him was however the teacher of the school at Seamer, which was a parish on the same road about two miles from Staxton northwardly. I cannot find out his name, so will write of him as X. The school-master, X, was a favorite of the lord of the manor of Seamer, a Mr. W. J. Denison, possibly a relative of his. I have a topographical dictionary issued in 1831, giving an article about every place in England. The article on Seamer states a remarkable thing about Mr. Denison, considering the year of which it is written, 1814. Mr. Denison laid out a large amount of money in that year in building schools for boys and girls and endowing them "liberally"; under this endowment the head-master appears to have been provided with a good place for life, since one item is said to have been a house for his use.

When Gill was sixteen, after the striking evidence of his youthful energy which was given when he assumed command of the apparently derelict vessel, Mr. X must have heard of the lad as the hero of the neighborhood, because Staxton was only two miles away, the nearest village. Mr. X was the great man of the vicinity as a schoolmaster, and may be supposed to have been himself better educated than any other teacher for miles around. When Gill was on his tour of the neighborhood looking for a place, Mr. X, if he did not know him already, was the first man whom he could approach, and we may be sure Gill had not a particle of bashfulness in his composition. I do not draw too far upon my imagination when I say that Mr. X was the very man to become his helper in this time of his real need. I assume that his help was forthcoming, and that Gill's getting the place at Ganton was due to his influence.

The *Ladies' Diary* for 1822 must have been beyond his means as a subscriber. There was probably no subscriber to it, except Mr. X, nearer than Scarborough, if, indeed, any more were to be found there. This was then a rather costly part of a teacher's outfit, and

if he subscribed in 1823, the price must have been a heavy tax on Gill's meagre salary. Before the end of 1823, Gill sent in answers to ten of the fifteen problems for that year, and he did perhaps better than ten, if we count quality as well as quantity. We are able to do so, thanks to the copy of the problems themselves sent me by Mr. Joffe for the purpose of comparing their value. They are inserted verbatim in an appendix. (See Appendix *A*.)

Of the fifteen questions given in 1822 for 1823 there were thirteen which may be considered geometrical, and two analytical. The two were Nos. 14 and 15, neither of which was answered by Gill. On the other hand, Gill's answer to the thirteenth question was not only given in full, but is singled out by the editor as positively the best. Considering that Gill entered the lists at the age of eighteen, though his age does not appear to have been stated, his answers to the questions contained in the *Diary* of 1823, printed in the *Diary* of 1824, must have made a sensation in the office. The *Diary* of 1825 shows his answers to the questions in that of 1824. Questions No. 13 and No. 14 remained unanswered by him, as did the last two of the year before, No. 13 being astronomical in its character, while No. 14 is equally or more difficult. Again his replies to two questions are printed in full, as before, with additions which gave the editor pleasure to insert. To No. 4, in the *Diary* for 1824, his answer was thought worthy of being stated as a new problem. In answering No. 10 he was in distinguished company, the same answer being given by Professor Thomson of the College of Belfast, the father of Lord Kelvin (*clarum ac venerabile nomen*).*

The *Ladies' Diary* for 1823 records that Professor James Thomson of the College of Belfast, and author of a treatise on arithmetic, proposed question No. 14, while that for 1825 says that Professor Thomson (obviously the same) and Mr. Charles Gill have answered No. 10 differently from a youth of fourteen, signing himself "W. S. B. Woolhouse." The identity of this precocious mathematician, burdened with those initials, cannot be mistaken by any reader of the *Journal of the Institute of Actuaries* of the past generation. I, for one, recognize the name as that of one who was to become famous as a Senior Wrangler at Cambridge and later as a prominent actuary usually called upon for any work of the Insti-

* I met Lord Kelvin at the Second International Congress of Actuaries, in which he was actively interested. He was presiding officer at the great dinner, and I had the honor of sitting next to him.

tute clearly requiring mathematical genius. The mention of Gill's answer, as being identical with that of Professor Thomson, was equal to giving him distinct rank as a first-class mathematician, and should have at once won him a higher post as a teacher.

Hessle.

The *Diary* shows him next teaching at Hessle, an important suburb of Hull, which was an older place than Hull, and was once so jealous of its rapidly growing neighbor as to become the subject of a lawsuit. Hull was named Kingston—or King's town—being given special privileges by its founder, King Edward I, and Hessle and one or two parishes near by were accused of a conspiracy against the drinking water of their upstart rival. In 1831 Hull had a population of 30,000 while Hessle had 1,021, the places being five miles apart. Hessle had a Wesleyan chapel as well as a church, and also had a national school besides the usual parish school. In which of them Gill taught cannot be told, though the national school was probably his choice, as the authorities of a public school would be more likely to employ a stranger, as he was, aided by a commendatory letter.

Gill may have left Ganton in 1825 or 1826, as none of the problems of the *Diary* of 1825 were answered by him. In 1825 he must have been too poor to pay the cost of subscription. I assume that he was too poor previously, because his first place was obviously the hardest. Mr. X must have given the use of his copies for two years, unless Gill had found some mathematical friend at Scarborough to lend them to him. Dr. Muhlenberg especially says, in speaking of Gill's poverty during his early years as a teacher, that he forebears "to relate what a long course of self-denial and relinquishment of the dearest enjoyments of life (for a number of years, indeed) he subjected himself to, in order to wipe off some pecuniary obligations, occasioned by the difficulties of his early career." Such a postponement of matrimony is not unusual, though the case must have been a peculiarly hard one. I assume that Gill made the acquaintance at Ganton of the young lady whom he married in Hessle in 1827 or 1828. Her name was Eliza E. ———, surname unknown. Hessle must have been a barely endurable place to live in, but Hull, near by, had some advantages. It was really a large city and contained, doubtless, many men of studious turn, of like views with himself. In 1822 there had been formed in Hull a

"Literary and Philosophical Society," which probably "took in" an annual copy of the *Ladies' Diary* for its reading room or library. Assuming that it did, Gill could better afford to pay the annual dues to the society than the charge, whatever it may have been, for a year's subscription to the *Diary*. In 1826 Gill answered for the *Diary* of 1827 seven of the fifteen questions, although—this being obviously the year for "Wunderkinder" as Mr. Joffe points out to me—Woolhouse, aged fifteen, and William Jacobs, aged fourteen, answered every question in 1826. Gill answered in 1828 none of the questions given out in that year, thus repeating the experience of 1825. Of his marriage in 1827 or 1828 I have thus far failed to discover the parish record, though I hope for news of it up to the last moment. I assume that every time Gill changed his school the change was for the better. Hessle had a considerably larger population than Ganton, and when he moved from Hessle to Seamer, where he doubtless occupied the comfortable house vacated by Mr. X, his best friend, he went, figuratively speaking, from a cottage to a palace.

Seamer.

Mr. X, who was installed by Mr. Denison at Seamer, when he built the schools there in 1814, had lived in the house erected for his use, until he moved to a better school in 1828. Gill was promoted to the best place he had before he left England, namely Seamer, when he was 23 years of age. The *Diary* for 1830 shows Gill to have answered in the previous year fourteen of the fifteen questions. That of 1831 shows him to have replied to thirteen out of fifteen. The years of Gill's stay at Seamer were years of prosperity and comfort. Not only was he able to free himself from debt, but he was also able to defray the cost of taking himself to New York with his family, which had been increased by the birth of a daughter on October 3, 1828. This, his first child, was named Eliza, after her mother.

For once in his lifetime everything seemed to turn out for the best. His reputation was made. The mathematicians of Great Britain, those of them, at least, who cared to enter the competition opened by the *Diary*, were represented during these ten years by several individuals who gained the highest honor, some in one year, some in another. I can say, looking over the list, that Gill's average was exceedingly high. Woolhouse and one or two others made a better average, but on the whole it may be stated with confidence

that Charles Gill was the peer of any. Books he had none, or so few as to be laughable in our eyes, and the fact that he was able to meet the requisites of the problems in the *Diary* was almost beyond credibility. I am only a cataloguer in writing this paper, I feel greatly the loss of the flowing words of some better writer than myself who would paint in proper terms the career of this brilliant young man from seventeen to twenty-five. The catalogue must suffice for the present, and the whole scene as it appears to one may be left for someone else to do justice to. We leave Gill at the height of his good fortune in England to embark on his fateful voyage with his little family to try his luck in the new world.

Saw Pits Academy.

Gill himself stated, when applying for insurance, years afterwards, to the Mutual Life, "I came to the United States January 1st, 1830." He at once sought employment. He took a place in Staten Island, which was a temporary refuge for want of a better, and exchanged it speedily for a more permanent position in Westchester County. This better place, which he found, according to Mr. Winston's statement, in a surprisingly short time—said to be ten days from his landing—was in a school, called Saw Pits Academy, which Mr. Joffe has located with great trouble in the village of Port Chester, now a part of the town of Rye. This school is mentioned in Scharf's *History of Westchester County* (Vol. 2, p. 698), which states: "This village (Port Chester), at the mouth of Byram River, was known early in the eighteenth century, and until within the last fifty years, as 'Saw Pit.' That very inelegant name had its origin in the fact that a spot on Lyon's Point, now part of the village of Port Chester, was occupied in ancient times for the building of boats. There was a landing here, known as 'Saw Pi*tt* landing,' as early as 1732; and in 1741 we hear of 'some small lots lately laid out at the Saw Pits, so called.' . . . The Saw Pit school-house stood on the west side of King Street, about forty rods from the railroad." Another school, worth mentioning in this connection, was in Rye proper and is referred to on p. 694: "There was a school-house a few years since on Regent Street, where a small office now stands (1886), not far from the corner of Purchase Avenue. Here one Evans B. Hollis taught school some fifty years ago. He was an Englishman, and is said to have been an excellent teacher." We

have seen the name of "Evans Hollis, Esq., Rye, New York," as the last of the subscribing supporters of the *Mathematical Miscellany,* started by Gill in 1836.

Gill himself was at an earlier day interested in an American publication, called the *Mathematical Diary,* which was first published in New York in 1825, and which continued until 1832. The title was one to recall the English *Ladies' Diary* and it was enthusiastically taken up by Gill in his characteristic manner. The first number which fell into his hands was that for 1830, and this contained problems for solution, of which Gill answered apparently a majority. For the issue of the year 1831, his answers were sent in too late for publication; but the *Mathematical Diary* for 1831 received one problem not too late for publication,—No. XXI, by "C. Gill, New York," freshly proposed (p. 193). The number for 1832 contained answers by "Mr. C. Gill, teacher of mathematics, Sawpits, N. Y.," who solved all but No. XXII and proposed two new problems, No. VIII and No. XVI.

Williams on the War Path.

In 1832 occurred the episode referred to in Bradley's *Memoirs of Strong,* already mentioned, and also by Cajori, in his *Teaching and History of Mathematics in the United States* (note to p. 96) of a general challenge addressed to the mathematicians of the United States by one John D. Williams. This man advertised in the *New York Commercial Advertiser* of November 30, 1831, "Algebraic questions by Diophantus, which he requests the mathematicians of the United States to solve—Dr. Bowditch, Professor Strong, E. Nulty, Dr. Anderson, C. Gill, and J. Cunliff being excepted. "Then follow fourteen questions (see Appendix B). Considering the little knowledge of Gill which was to be found in America within a year of his arrival, the fact that the *Mathematical Diary* for 1831 could contain enough of his work to make him so well known is very striking. Six months later, June 1, 1832, Mr. Williams inserted a renewal of his challenge which may also be found in Appendix B. It will be seen that Mr. Williams changed his list of excepted names. The names of Gill and Professor Henry J. Anderson, of Columbia College, are returned to the list of challenged. There may have been some animus against Gill to account for his transfer from the rank of Sheep to that of Goat, or perhaps it was made in good faith, based on a careful study of previous numbers of the *Mathematical Diary.*

The only reason for a contrary suspicion is based on the unfriendly reference to him in a footnote to the advertisement given in Appendix B. It will be seen by the Appendix that "a certain teacher in this city who goes by the nickname of Professor has offered to solve the 9th question for $5.00." Williams says enough to point out that Gill is the culprit, in saying "a certain teacher in this city." His statement implies that the teacher has been in correspondence with him. He says that he has not received any correct solution to all the questions, showing that some one—Gill, to wit—had endeavored to solve some of them. He gives Gill's address as Sawpitts Academy, in the obsolete spelling of the previous century, though Gill himself must have given it, as he did to the forthcoming *Diary* of 1832, in the more modern form. There were only two others in the list not known to be professors, except Mr. Floy and Samuel Ward, 3d. Ward is separately called by Williams "this gentleman," the last on the list; and I have personal knowledge that Floy was a man of brilliant parts, a friend of my own family, who might conceivably be a teacher, but if so he would have given his address. Both men were, like the others in the list, known to the editor of the *Mathematical Diary*. In short, it would seem that Williams made a personal attack on Gill, spiteful and vicious, of which any reader can judge as well as I. Gill had obviously proposed to take $5.00 for one solution, and had proposed it probably to get money from a supposedly rich advertiser. Williams replied by way of the newspapers, offering him $20.00 to prove whether a solution was possible or impossible. Perhaps Gill was really called Professor before his time by some of his students. Half the actuaries in the Society have suffered by the misuse of this same title.

During his stay at the Sawpits Academy Gill's reputation was gradually built up by his work in the *Mathematical Diary*, until it stood in the first rank in the year 1832. Probably early in the next year there happened one of those fortunate occurrences which sometimes color a whole lifetime. Gill saw an advertisement which had been inserted by Dr. Muhlenberg, showing the need of a mathematical teacher at Flushing, Long Island. Gill regarded this advertisement as something precious, and kept about him a clipping from the paper containing it for more than twenty years until his death, when, says Dr. Muhlenberg, it was found in his pocket.

St. Paul's College, Flushing.

Some account of his life at Flushing has been in the previous paper, to which the reader is referred. The time passed happily and peacefully, though at least one occasion was found by Muhlenberg for fearing "that he supposed that I wished him to dispense with his services." Muhlenberg says, in substance, that Gill was hardly patient enough with stupid boys, having heard from him that he had, in his own boyhood, "read the first six books of Euclid in one day." "He gradually seemed, however, to accommodate himself to the average mind of the young, and made good scholars." "He would never allow that he had made more than one mathematician," but to this one rare bird, whose name is not given, at Gill's request Muhlenberg awarded a gold medal, the only medal ever given in the college. We can imagine the enthusiasm with which the young man was taken up by Gill, as a man after his own heart, and the joy with which he treated the news of his success subsequently at the Ecole Polytechnique in Paris, where he achieved rapidly a "distinguished reputation," a reputation which showed the St. Paul's medal, granted obviously only after much insistence by Gill, to have been wisely bestowed after all. Dr. Muhlenberg says: "While at Flushing Mr. Gill made a translation of the great work of La Grange, which still remains in manuscript." Which great work is meant I do not know. No trace of it is left among the papers that are preserved in the office of the Mutual Life. Dr. Muhlenberg stated that Gill "became a communicant of the Episcopal Church some three years after he formed his connection with me." This somewhat indefinite statement I take to mean that Gill was not confirmed at that time, but was admitted to communion as a member of the Church of England by Dr. Muhlenberg, as president of the college, being himself a clergyman.

The *Mathematical Diary* not appearing after 1832, its place was filled by the appearance of the *Mathematical Miscellany* in the spring of 1836 under the editorship of Charles Gill. I broke off my account of Gill's opening paragraph in my first paper too abruptly, from the irksomeness of copying, and now give it as Appendix C.

There is lacking, in the copy before me, a small fragment, which had been printed apparently as a loose piece of paper, not paged, in front of the third number of the *Miscellany* and bound in with at least one copy, which is preserved in the Library of Columbia

University. This fragment has been called to my attention by Mr. Joffe, and for personal reasons I venture to mention it to the Society. It gives for the information of the readers of the third number, which was printed in the spring of 1837, several names of persons willing to make an annual contribution for a stated amount, including Professors Penney and Strong pledging $15 each, and several other names, six in all, of which I select those of Professors Caldwell and McClintock, Dickinson College, Carlisle, Pa., $5.00.*

Gill brought out his *Miscellany* by semi-annual numbers regularly for four years, ending with 1839. In the first number he began a treatise on *Spherical Geometry,* which was completed in the third number. His *Hints to Young Students,* having a purely pedagogic character, which are given clearly and must have been found effective, were continued through several numbers.

In the fourth number began a series of articles on the Diophantine Analysis, by William Lenhart, which he named *Diophantine Speculations,* which would be interesting reading at the present day. The sixth number had two articles by distinguished writers, one following the other, respectively by Professors Strong and Peirce, one on the orthographic projection of the circle, and the other, somewhat longer, giving an account of a recent English work on the Integral Calculus.

The last number (the eighth) for November 1, 1839, contains an article by Δ, on the application of Sturm's Theorem, which happens to be personally interesting to me. This gives for the fourth and fifth degrees respectively, the real roots if they exist, and the rules which enable one to determine them. The details are given, and

* Merritt Caldwell and John McClintock, who held the scientific chairs at that time: John McClintock, my father, was Professor of Mathematics, just entering on life, having been graduated in June, 1835, from the University of Pennsylvania at the age of 20. As the youngest member of the faculty, the smallness of the amount contributed by him, about $2.50, may be excused. Some early manuscript books and boyish exercises are all the relics of that time which I have of him. Among them I find the advertisement printed on the last page of a text-book that he at the age of seven had attained proficiency by the use of this particular grammar. From some of his students I have gathered that he was alert, cautious, and stimulating in his classes. He was a born orator. I knew him later as a theologian, a scholar of many branches, and a voluminous writer; his books including a series of Latin and Greek text-books. He had the genius which consists in "an infinite capacity for taking pains," being laborious to the last degree, literally killing himself with work at the age of 55.

coincide, in each case, with the results (special cases) of my own paper on the same subject.*

It has been previously stated that the last number closes abruptly without explanation or warning, and the *Mathematical Miscellany* came to an end with Gill's four years' editorial work, at the same time. In this same year, 1839, Gill re-appeared in the *Ladies' Diary,* writing from and dating his article from St. Paul's College, Flushing. This article is "On the General Equation of the Fifth Degree." It appears to be really a copy of the article by Δ, above referred to, and, if so, Δ was Gill himself. This article is given in Appendix D.

In 1842, Gill's son, William C. Gill, was born.

The preface of Gill's first book, the only one which he is known to have written, entitled "*Application of the Angular Analysis to the Solution of Indeterminate Problems of the Second Degree*" was dated March 29, 1848. This was published in 1848, by John Wiley, New York, and by Wiley and Putnam, London, and contained 91 pages. The publishers stated recently that "the book is extremely scarce and most of the impression was destroyed." The chief object of the preface is to acquaint the reader that the applications of his new theory are mainly devoted to the Diophantine Analysis. Obviously, the questions so boastfully advertised by Mr. Williams had not been forgotten. I regret that this little book is too long for insertion in an Appendix.

Close of the Second Paper.

I am obliged to close the second paper abruptly, as I did the first. The second is already about twice as long as the first, including some parts which are most conveniently printed as Appendices. The third paper, partly written, will be contributed later. The Society is long-suffering, as my experience of it has proved, but I do not think that even the necessary appendices will be found too trying, considering the honor which the Actuarial Society owes to the memory of the first actuary in America. Gill was the first actuary of the Mutual Benefit as well as of the Mutual Life, as has

*"A Method for Calculating simultaneously all the Roots of an Equation." This is summarized in Merriman's *Solution of Equations,* pp. 29–31, published by John Wiley & Sons, New York, giving me full credit, citing Vol. XVII of the *American Journal of Mathematics,* and stating that, "by this method all the roots, whether real or imaginary, can be computed from a single series."

been stated in various publications. The two periods of service were, in both cases, highly appreciated; the last, short as his life was, extending to six years; and both left important traces, little as was known, until lately, about him.

APPENDIX A.

Extracts from the "Ladies' Diary: or, Complete Almanack" bearing upon Charles Gill's Contributions

No. 120 (1823), *pp. 47–48.*

New Mathematical Questions.

I. Quest. (1404); by Mr. Joseph Gritton, London.

The diameter of the base of a right cone is equal to its slant height; and its solid and superficial contents are numerically equal. Required the dimensions and content.

II. Quest. (1405); by Mr. Thomas Baker, Elm Park, Durham.

AHCB is a given segment of a circle, *AB* the chord, *H* the middle of the arc, and *C* any point in it: join *AC, CB, CH;* then $AC \cdot CB + CH^2 =$ a constant quantity. Required the demonstration.

III. Quest. (1406); by Mr. Tho. Todd, Northwich.

Given the sum of the sides which include the right angle, when the square of half the greater of those sides is equal to their rectangle; to construct, geometrically, the right angled plane triangle.

IV. Quest. (1407); by Mr. Isaac Newton, Lynn Regis.

Let the variable right line *DEB* revolve upon *B* as a centre in the same plane; and let it be always so divided at a point *E* as to make $DE^2 + EB^2 =$ a given square. Required the loci of the points *D* and *E*.

V. Quest. (1408); by the Rev. John Sampson, Kendal.

If to the three angles of any plane triangle, lines be drawn from these three points, viz. the centre of the circumscribing circle, the centre of the inscribed circle, and the intersection of the perpendiculars (from the three angles upon the opposite sides); the line drawn to either angle from the centre of the inscribed circle, always bisects the angle made by the lines drawn thence from the other two points. Required a demonstration.

VI. Quest. (1409); by Mr. W. Burdon, York.

The number of vibrations made by a globe when suspended by a point on its surface, is to the number made in the same time when suspended by a string twelve inches in length, as seven to six. Required the diameter of the globe.

VII. Quest. (1410); by Mr. John Baines, Bawtry.

Required the angle which the line drawn through the moon's horns will make with the vertical plane; also the point in which that line continued will cut the horizon, on Aug. 11th next, at 6 h. P. M. at Greenwich; by a general method applicable to any other time and place.

††† A similar question appeared in the Diary some years ago; but the problem is thought susceptible of a better solution.

VIII. Quest. (1411); by Mr. J. Brown, Epping.

In a right angled triangle ABC, there is given the hypothenuse $AC = a$, to find its area when $AB^n \times BC^{n-1}$ is a maximum.

IX. Quest. (1412); by Mr. R. Maffett, Plymouth.

Let C, C' be two fixed points 50 inches asunder; and let CP, $C'P'$, be two inflexible bars each 24 inches long, moving freely about the respective centres C, C': let $PP' = 14$ inches be an inflexible bar playing freely upon pivots or joints at P, P'. It is required to investigate the nature and quadrature of the curve MRS, described by M, the middle point of PP', while the three connected rods CP, PP', $P'C'$, move freely about the centres C, C'.

N. B. The system here described is obviously analogous to "the parallel motion" in Mr. Watt's steam engine.

X. Quest. (1413); by Mr. W. D. Rangeley, Stone.

Two points are given by position, also a plane inclined to the horizon in a given angle. Each end of a flexible string being fastened at one of the given points, and a ball of a given diameter being hung on the string by means of a very small hook; it was observed that when the ball was at rest it just touched the plane. It is required to determine, geometrically, the point of contact.

XI. Quest. (1414); by Mr. Matthew Neil, Anderton, near Glasgow.

Let AB, BC, CD, be arcs of a circle of given diameter, and P any point within that circle, to which right lines AP, BP, CP, DP, are drawn from the extremities of the several arcs. Now the arcs AB, CD, are known, as well as the angles APB, BPC, CPD; whence the middle arc BC is required.

XII. Quest. (1415); by Mr. W. Wiseman, Hull.

Let M apparent, and M' true altitude of the moon; S and S' the apparent and true altitudes of the sun or a star; D and D' the apparent and true distances of the moon and sun, or star: then the versin $D' =$ versin $(M' \backsim S') + \cos. M' \cos. S'$

$$\frac{\text{versin } D - \text{versin } (M \backsim S)}{\cos. M \cos. S}.$$ Required a demonstration.

XIII. Quest. (1416); by the Rev. John Sampson, Kendal.

It is required to find the sides of a scalene triangle ABC in integers, such that the area may be an integer, and the three lines

AO, BO, CO, may be likewise integers, *O* being the centre of the inscribed circle.

XIV. Quest. (1417); by James Thomson, A.M. Professor of Math. in the College of Belfast, and Author of a Treatise on Arithmetic.

Prove that of the two infinite serieses

$$1-\cos \tfrac{1}{3}\phi + 3^2(1-\cos \tfrac{1}{9}\phi) + 3^4(1-\cos \tfrac{1}{27}\phi) + 3^6(1-\cos \tfrac{1}{81}\phi) + \text{etc.}$$

and

$$1-\cos^3 \tfrac{1}{3}\phi + 3^2(1-\cos^3 \tfrac{1}{9}\phi) + 3^4(1-\cos^3 \tfrac{1}{27}\phi) + 3^6(1-\cos^3 \tfrac{1}{81}\phi) + \text{etc.}$$

three times the first exceeds the second by $\frac{1}{8}\phi^2 - \frac{1}{2}\sin^2 \frac{1}{2}\phi$.

XV. Or Prize Question (1418); by Investigator.

[Whoever answers it before Feb. 1, has two chances for ten Diaries.]

If the fraction $\frac{1}{23}$ be converted into a decimal, it will be a repetend, or circulate; viz.

$$.\dot{0}4347826086$$
$$95652173913\dot{}$$

in which these properties obtain.

1. The number of places in the circulating period is $23-1$; and whenever the denominator is a prime number n (except 2 or 5) the number of places in the circulating period is always either $n-1$, or $(n-1) \div m$, m being an integer less than n.

2. The first and the last half of the period consist of figures, which, added term by term, constantly make 9: as, $0+9$, $4+5$, $3+6$, etc.

3. The same circulating period includes all the repetends respectively equivalent to $\frac{2}{23}$, $\frac{3}{23}$, $\frac{4}{23}$, etc., each commencing at an easily assignable place: thus, $\frac{3}{23} = .13043478$, etc.

Required a demonstration of these properties applicable to all fractions whose denominator is a prime number, greater than 5.

No. 121 (1824), *p. 33.*

Mathematical Questions Answered

[List of Mathematical Contributors, and of Questions ans. by each.]

. . . . . .

. . . . . .

C. Gill, Ganton, near Scarbro', Qu. 1 to 8, 10, 13.

. . . . . .

. . . . . .

p. 34.

*** From this valuable collection of solutions, the Editor has, with much impartial solicitude, selected the following; with a constant regard to the interests of science, the encouragement of his young correspondents, and the reputation of all.

. . . . . .

p. 43.

XIII. Question, ans. by Mr. C. Gill, Ganton, near Scarborough.

Let ABC be the triangle, and O the centre of its inscribed circle. Put $AO=a$, $BO=b$, $CO=c$, and $DO=EO=FO=$ rad. of inscribed circle $=r$. Then, as AO, BO, CO, bisect the angles A, B, C, respectively, we shall have $BD=BF=\sqrt{b^2-r^2}$; $AF=AE=\sqrt{a^2-r^2}$; $CD=CE=\sqrt{c^2-r^2}$. Hence $AB=\sqrt{b^2-r^2}+\sqrt{a^2-r^2}$, $BC=\sqrt{b^2-r^2}+\sqrt{c^2-r^2}$, and $AC=\sqrt{a^2-r^2}+\sqrt{c^2-r^2}$. Now these sides will evidently be whole numbers, if (a^2-r^2), (b^2-r^2), and (c^2-r^2) are integral squares. Assume these $=m^2$, n^2, and s^2, respectively. Then $a=\sqrt{m^2+r^2}$, $b=\sqrt{n^2+r^2}$, and $c=\sqrt{s^2+r^2}$: and, if we take $r^2=p^2+2pm$, $=q^2+2qn=t^2+2ts$, we shall get $a=m+p$, $b=n+q$, $c=s+t$, and the area $=r(m+n+s)=wh$. From the preceding three equations, we deduce $m=(r^2-p^2)/2p$, $n=(r^2-q^2)/2q$, and $s=(r^2-t^2)/2t$; where we have only to assume such values for r, p, q, and t, as shall make m, n, and s, whole numbers.

Take, for example, $r=12$, $p=2$, $q=4$, $t=6$: then $m=35$, $n=16$, $s=9$. $AO=37$, $BO=20$, $CO=15$, $AB=51$, $BC=25$, $AC=44$, and the area $=720$.

The following are selected from the numerical results of different investigations:

. . . . . .

The proposer, $DO=165$, $OA=325$, $OB=429$, $OC=275$, sides 676, 616, 500.

. . . . . .

In all these we have omitted the areas; the smallest next to Mr. Gill's is Mr. Brown's, viz. 15,840.

pp. 46–48.

New Mathematical Questions.

I. Quest. (1419); by Mr. Henry Ward, Stafford.

There are three numbers, the difference of whose differences is 5, their sum 14, and the product of the first and third multiplied into the cube of the second is 270. What are the numbers?

II. Quest. (1420); by Mr. Joseph Waters, Newark-upon-Trent.

Required a general theorem, by means of which any natural number may be divided any number of ways into three rational cubes.

N. B. This gentleman is about to publish by subscription an extensive work on the Diophantine Analysis.

III. Quest. (1421); by Mr. R. Oats, St. Just, in Penwith.

If a quantity of water equal to a cubic mile were poured on an extended plane in contact with the earth at its middle point, what would be the area of the plane (supposed a circle) that the water would cover, and the greatest depth of water on it, supposing the earth's radius 4000 miles?

IV. Quest. (1422); by Investigator.

Find 10 numbers increasing successively by 1, in arithmetical progression, such that not one of them shall be a prime, by a general method applicable to any other case.

V. Quest. (1423); by Mr. G. Ellis, Acomb, near York.

The solidity of a cone is 301.5936 inches; and, it is known, that its centre of gravity is one inch farther from the vertex of the cone than the centre of the greatest sphere that can be inscribed in it. Required the dimensions of both the cone and the sphere.

VI. Quest. (1424); by Mr. W. Rutherford, Woodburn-school.

Let AB be the diameter of a given semicircle ACB, and CD any right ordinate on which is described the equilateral triangle CDP. Required the quadrature of the curve, which is the locus of the point P.

VII. Quest. (1425); by Mr. John Baines, Bawtry.

Let ABC be a triangle right angled at B, whose base AB is given; and, in the variable hypothenuse, AC, take AP such that $AP.BC$ may be always $= AB^2$. Find the equation and area of the curve which is the locus of P.

VIII. Quest. (1426); by Mr. Isaac Newton, Lynn Regis.

If from a given point P, either within or out of a given circle, a right line PC be drawn to the circumference, and PC be divided at E in a given ratio, the locus of E will be a given circle. Required a demonstration.

IX. Quest. (1427); by Pappus.

Draw any line BC meeting the side FA (produced) of the triangle ACF, and let the triangle ACF revolve about the line BC. Then is the solid generated by the triangle ACF, equal to a cone whose alt. is the perp. CE, and its base a circle equal to the superficies described by AF during the rotation. Required a proof.

X. Quest. (1428); by Mr. W. Mawson, Witton-le-Wear.

Demonstrate that an attractive force, which varies in the inverse duplicate ratio of the distance, cannot be constituted of several forces, each of which does not vary in that ratio.

XI. Quest. (1429); by Mr. W. Godward, Middlewich.

Of all cones of the same capacity, it is required to determine the dimensions of that along the slant side of which a heavy body will descend in the least time possible.

XII. Quest. (1430); by Mr. Jonathan Horner, Knaresborough.

Required the base diameter, and the altitude, of a paraboloid, when its solidity is 324, and the time of vibration a minimum, the point of suspension being the vertex.

XIII. Quest. (1431); by Mr. Thomas Squire, Epping.

On the 1st of December, whilst a lunarian astronomer was watching the progress of a solar eclipse, he observed a projection on the dark body of the earth, and which impeded the evanescent ray of the sun. Admitting this to have been the peak of Teneriffe, N. lat. 28° 17′ W. long. 16° 40′, and that the situation of the observer was exactly on the first point of ingress of the total shade; what would be the *time*, and on what part of the moon's periphery would the said eclipse be seen to begin at Greenwich, supposing the sun's declination to be 21° 52′ 20″ S, and the ☽'s semidiameter 16′ 13″?

XIV. Quest. (1432); by Mr. John Woodrow, Hingham, Norfolk.

A uniform lamina of matter in the form of a given triangle is suspended by a fine string, without weight or inertia, attached to one of its angular points, and made to vibrate edgeways. It is required to find the time of the small oscillations, the length of the string being such that a small variation therein may cause no sensible variation in the time of vibration.

XV. Or Prize Question (1433); by the Editor.

[Whoever answers it before Feb. 1, has two chances for ten Diaries.]

In the appendix to Mr. Cavendish's paper on the mean density of the earth, (Phil. Transac. vol. 88,) when computing the attraction of the mahogany case used in his experiments, he finds the attraction of a rectangular plane, as *BCDE*, in direction *BC*, by a logarithmic expression, but the attraction in the direction *AC*, perpendicular to that plane by a tedious series. Now, if $AC = a$, $CD = b$, $CB = x$, the attraction in the first direction will be the correct fluent of $\frac{bx\dot{x}}{(a^2+x^2)\sqrt{a^2+b^2+x^2}}$; while that on A in the direction AC will be the correct fluent of $\frac{ab\dot{x}}{(a^2+x^2)\sqrt{a^2+b^2+x^2}}$. It is required to determine both of these in terms either of logarithms or of trigonometrical quantities, without series.

No. 122 (1825), p. 33.

Mathematical Questions Answered.

[List of Mathematical Contributors and of Questions ans. by each.]

.....

Charles Gill, Ganton, near Scarbro', Qu. 1 to 12, Pr.

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pp. 36–37.

(After giving Mr. N. J. Andrew's solution to Question IV., the following note is added:)

Mr. Cha. Gill, of Ganton, deduces this Theorem, viz.—If p be any prime number, and m the product, or any multiple of the product of all the primes under p; then will $m+2$, $m+3$, $m+4$, etc. to (at least) $p-2$ terms, but often to many more, be a series of consecutive numbers, not one of which will be a prime.

p. 41.

X. Question, ans. by Mr. W. S. B. Woolhouse (aged 14);

. . . . . .

Otherwise, by Professor Thomson, and Mr. Charles Gill.

Let D denote any fixed distance from the centre, and A a constant quantity; then ϕD, $\phi' D$, $\phi'' D$, etc. denoting any functions of D, except m/D^2, m'/D^2, etc. m, m', etc. being constant quantities, we are to prove that $\phi D + \phi' D + \phi'' D + \text{etc.} = A/D^2$, cannot be true when D varies. Now, let D become $\Delta + D$; then $\phi(\Delta + D)$, $\phi'(\Delta + D)$, etc. may be expressed by series, and we should have

$$\left.\begin{array}{l} a \;+b\;D + c\;D^2 + \text{etc.} \\ a' +b'D + c'D^2 + \text{etc.} \\ a'' +b''D + c''D^2 + \text{etc.} \\ \quad + \text{etc. etc. etc.} \end{array}\right\} = \frac{A}{(\Delta + D)^2},$$

where a, a', b, b', etc. are constant coefficients. Multiplying by $(\Delta + D)^2$ and contracting, we should have a series of the form $\alpha + \beta D + \gamma D^2 + \delta D^3 + \text{etc.} = A$, a constant quantity; which is impossible, if D vary.

APPENDIX B.

New York Commercial Advertiser.

Vol. XXXIV. New York, Wednesday Evening, November 30, 1831.

For the Commercial Advertiser.

Algebraic questions, by Diophantus, which he requests any mathematician in the United States to solve—Dr. Bowditch, Professor Strong, E. Nulty, Dr. Anderson, C. Gill, and J. Cunliff, being excepted.

1. Make $x^2 + y^2 = a^2 = z^2 + w^2 = \text{sq.}$, and $x^2 - w^2 = z^2 - y^2 = \text{sq.}$
   Ans. if $a = 7585$, then $x = 7400$, $y = 1665$, $z = 6273$, $w = 4264$.
2. Make $x^2 + y^2 = b^2 = z^2 + w^2$ and $x^2 - z^2 = w^2 - y^2 = \text{sq.}$
   Ans. if $b = 697$, then $x = 680$, $y = 153$, $z = 672$, and $w = 185$.
3. Make $x^2 \pm 23256x = \text{sq.}$, $x^2 \pm 75000x = \text{sq.}$, and $x^2 \pm 103224x = \text{sq.}$
   Ans. $x = 105625$.

4. Make $x^2 - 23256^2 = \square$, $x^2 - 75000^2 = \square$, $x^2 - 103224^2 = \square$. Ans. $x = 105625$.

5. Make $x+y+z=a^3$, $x+y=b^3$, $x+z=c^3$, and $y+z=d^3$ in positive whole numbers.

6. Make $x^2 \pm 96x = \square$, $x^2 \pm 135x = \square$, and $x^2 \pm 154x = \square$.

7. Make $182^2x^2 \pm 182x = \square$, $560^2x^2 \pm 560x = \square$, and $630^2x^2 \pm 630x = \square$.

8. Make $136^2x^2 \pm 136x = \square$, $170^2x^2 \pm 170x = \square$, and $174^2x^2 \pm 174x = \square$.

9. Make $(m^2+n^2)^2x^2 \pm (m^2+n^2)x = \square$, $(m^2-n^2)^2x^2 \pm (m^2-n^2)x = \square$, and $4m^2n^2x^2 \pm 2mnx = \square$.

10. Make $\frac{xyz}{x+y+z} = \square$, $x^2 + \frac{xyz}{x+y+z} = \square$, $y^2 + \frac{xyz}{x+y+z} = \square$, and $z^2 + \frac{xyz}{x+y+z} = \square$, all in whole numbers.

11. Make $(m^2+a^2)^2 \pm 4abm(m^2+a^2)(m^2-a^2) = \square$, and $(m^4+2m^2a^2+a^4) \pm 4acm(m^2+a^2)(m^2-a^2) = \square$.

12. Make $x^2+y^2 = \square$, $\frac{5}{4}(x^2+y^2) =$ a cube, $xy = 2x^3$, $2(x+y) + \frac{xy}{x+y} = \square$, and $(x^4+y^4)(x^2+y^2) - (x^5+y^5)\sqrt{(x^2+y^3)} = \square$.

13. Make $x^2 \pm 97104 = \square$, $x^2 \pm 150000 = \square$, $x^2 \pm 173400 = \square$, and $x^2 \pm 180576 = \square$.

14. Find the least values of x, and y, in whole numbers that solve the equation $x^2 - 940751y^2 = 38$.

New York Commercial Advertiser.

Vol. XXXV. New York, Friday Evening, June 1, 1832.

Communication.

Messrs. Editors—It is this day six months since under the signature of *Diophantus,* I proposed through the medium of your paper, to the mathematicians of America, a collection of problems in Diofantine Analysis. No correct solutions having as yet been received to the whole of them; I take this opportunity to fulfill *my* pledge to furnish such, and enclosed they will come to your hands. I now desire to re-propose them for the ensuing six months; and shall except from my challenge the Hon. Nathaniel Bowdich, L.L.D. &c. &c. of Boston, Mass., Mr. Eugene Nulty, of Philadelphia, and Professor Theodore Strong, of Rutgers College, New Brunswick, N. J., *only.* The list of gentlemen challenged stands then, as follows:

Professor Robert Adrain, University of Pennsylvania.
Henry J. Anderson, Columbia College, N. York.
Benj. Peirce, Harv. Univ., Cam. Massachusetts.
Mr. J. Ingersoll Bowdich, Boston, Mass.
" Marcus Catline, Hamilton College, Clinton, N. York.

Mr. M. Floy, jun., New York.
" C. Gill, Sawpitts Academy, New York.
" L. L'Inconnew, Cincinnati, Ohio.
" Benjamin Hallowell, Alexandria, D. C.
" Charles Farquhar, Alexandria, Maryland.
" Samuel Ward,* 3d, New York.

It being presumed that there are none in the United States, with the exception of the above list would think of attempting their resolution, the questions proposed are as follows: (Here follow the same 14 questions as were published on November 30, 1831.)

* I beg leave to state that on the 2d day of March last, I received from this gentleman correct solutions to questions 1, 2, 3, 4, 5, 10, 13 and 14. This I suppose is about his *ne plus ultra*—beyond it I defy him to advance. "Till riper age shall with maturer force burnish his mind."

☞A certain teacher in this city who goes by the nick-name of *Professor* has offered to solve the 9th question for $5.00; I now offer him $20.00 to prove either its *possibility* or *impossibility*, and shew all the conditions that can exist, and those that cannot.

QUERY.—Will Professor James Renwick favor me with an explanation of the last 20 lines, Book 1, page 8, of his excellent "Elements of Mechanics," just published.

Yours very respectfully,
JOHN D. WILLIAMS.

NEW YORK, June 1st, 1832.

APPENDIX C.

ADVERTISEMENT (BY GILL ANNOUNCING THE FIRST ISSUE OF THE *Miscellany*).

The first number of the *Mathematical Miscellany* is an experiment. It is presented to the public without the courtesy of a prospectus, in the belief that its character and claims to patronage will be better understood by giving a specimen, than a promise of what it will be.

The high estimation in which such works are held by the European mathematicians, and the fact that the great improvements in Analysis, and the vast variety of elegant problems scattered through the elementary works on science in present use, have generally first appeared in them, and are principally due to the discussions and investigations they are calculated to bring forward, are at least presumptive evidence that a miscellany of this kind might be made sufficiently interesting, were the talent of the country, of which there is certainly no want, concentrated in its aid.

The advantages of such a work, as a medium for valuable communications that might otherwise be lost to the public; as an index

to mark the taste in science, and the progress in discovery, of the day and of the country; and as a field where the aspirant to mathematical distinction may try his strength with those of established reputation, will be perceived at once by all who would think of patronizing this undertaking.

The Editor has the assurance of assistance from individuals whose names would be a sufficient guarantee for the respectability of the work; and if he succeeds in establishing it, he has no doubt of enlisting in its aid much of the mathematical talent of the United States. He begs leave to commend his undertaking, in particular to gentlemen of the mathematical chairs in our colleges, with the suggestion, whether it might not be made a useful auxiliary in cherishing a spirit of science in their classes. Should this suggestion meet their view, there will be formed a distinct department adapted to this purpose; and pains will be taken to make this part of the work interesting, for it will be peculiarly gratifying to the Editor, if he can supply the means in any degree of fostering the emulation of American youth in a study which is peculiarly adapted to the enquiring mind, and which is daily becoming of more practical importance to the country.

The *Mathematical Miscellany* will appear semi-annually on the first days of March and October; thus making the summer interval of seven months, and the winter one of five; a distinction which will be at once appreciated by the *student*. The price of each number will be 50 cents, and as it is not designed to secure any profit from the publication, the size of the work will be increased to whatever extent its sales will allow.

APPENDIX D.

From the Ladies' Diary for 1839.

ON THE GENERAL EQUATION OF THE FIFTH DEGREE.

By Mr. C. Gill,

Professor of Mathematics in St. Paul's College, Flushing, Long Island.

The Note appended to the 58th page of the last Diary will lead young mathematicians to entertain an opinion of Sturm's Theorem, by no means commensurate with its merits. If it could be applied to no other purpose than the solution of numerical equations, it has the merit of being infallible, as well as direct in its application. Even under the circumstances where other methods might be used to detect the nature of the roots with greater facility, a modification of this theorem may be used, which will require no greater labour, and which has still this advantage, that whereas even Mr. Horner's method may only "induce a suspicion," which it may require other

and distinct processes to confirm or to overthrow; by this method the actual difficulty is detected, and a recurrence to the correct and true process is at once easy and direct. But it is not alone in its application to numerical equations that Sturm's Theorem is valuable: it can be applied to cases where the coefficients are functions of one or more indeterminate constants, and thus be made subservient to the general purposes of analysis. Every analyst has felt how tantalizing it is when, in the course of his investigations, he arrives at a resulting equation of a degree greater than the third; and when, in most cases, he only wishes to know the nature of the roots, or the relation of the constants, which will render them of some assigned nature, he is, in fact, obliged to abandon the enquiry. A remarkable example of the kind of investigation I mean, when the resulting equation is of the third degree, may be seen at page 13, vol. i., of the "Mathematical Miscellany;" and if Sturm's Theorem can supply us with similar criteria for equations of higher degrees, it will fill a gap in the requirements of algebra that no other known method could do. I have applied this process to the general equation of the fourth degree, and the results will be published in No. 7 of the "Miscellany;"* and I propose to give here some of the more prominent results when it is applied to the general equation of the 5th degree, confident that when the readers of the Diary feel that this theorem may thus be made the instrument of analysis, they will hasten to modify and extend them.

Taking the Theorem of Sturm, as given in Professor Young's "Theory of Equations," and preparing the polynomials, by multiplying them by the square, or essentially positive denominators of their coefficients, we have, for the general equation of the fifth degree,

$$x^5 + ax^3 + bx^2 + cx + d = 0,$$

$$\begin{aligned}
X &= x^5 + ax^3 + bx^2 + cx + d,\\
X_1 &= 5x^4 + 3ax^2 + 2bx + c,\\
X_2 &= -2ax^3 - 3bx^2 - 4cx - 5d,\\
X_3 &= (40ac - 12a^3 - 45b^2)x^2 + (50ad - 8a^2b - 60bc)x - 4a^2c \\
&\qquad - 75bd\\
&= Ax^2 + Bx + C.\\
X_4 &= (4cA^2 + 2aB^2 - 2aAC - 3bAB)x + 5dA^2 + 2aBC - 3bAC\\
&= Dx + E,\\
X_5 &= BDE - CD^2 - AE^2.
\end{aligned}$$

Making thus, for the coefficients of the polynomial X_3,

$$\begin{aligned}
A &= 40ac - 12a^3 - 45b^2,\\
B &= 50ad - 8a^2b - 60bc,\\
C &= -4a^2c - 75bd;
\end{aligned}$$

* The Miscellany will generally be ready for distribution in London fifteen days after its publication in New York, that is, about the 15th of May and November of each year, leaving sufficient time for correspondents in Great Britain to prepare and transmit their communications.

and, for those of the polynomial X_4,

$$D = 4cA^2 + 2aB^2 - 2aAC - 3bAB,$$
$$E = 5dA^2 + 2aBC - 3bAC.$$

In calculating these coefficients, it must be recollected that if those of any one polynomial, as, for instance, A, B, C, have a common divisor, that divisor may be neglected. And it is also evident that, in cases where the ordinary methods might be advantageously employed, that is, where the real roots are widely separated, approximate values of these coefficients might be used; thus, if a contain two digits, A, B, C may contain seven digits under unfavorable circumstances; but if we divide them each by 10, or 10^2, or 10^3, &c., and neglect the remainders, the quotients may be used instead of the coefficients themselves, to calculate the succeeding coefficients. If any of the leading or terminating coefficients of the succeeding polynomials are found to approximate to zero, the true values must be used; for, under such circumstances, there will be roots either equal or having a very small difference.

Now, for $x = \infty$, these polynomials will become

$$X = +\infty,\ X_1 = +\infty,\ X_2 = -a\cdot\infty,\ X_3 = A\cdot\infty,\ X_4 = D\cdot\infty,$$
$$X_5 = BDE - CD^2 - AE^2.$$

Let i be the number of changes of sign in these quantities, and represent by m the number of real roots of the equation $X = 0$; then we shall have, as a known consequence of Sturm's Theorem,

$$m = 5 - 2i, \text{ or when } i > 2,\ m = 2i - 5.$$

Then we may form the following Table of conditions: when

			$X_5 > 0$		$X_5 < 0$	
$a > 0$	$A > 0$	$D > 0$	$i = 2$	$m = 1$	$= 3$	$m = 1,$
"	$A > 0$	$D < 0$	4	3	3	1,
"	$A < 0$	$D > 0$	2	1	3	1,
"	$A < 0$	$D < 0$	2	1	1	3,
$a < 0$	$A > 0$	$D > 0$	0	5	1	3,
"	$A > 0$	$D < 0$	2	1	1	3,
"	$A < 0$	$D > 0$	2	1	3	1,
"	$A < 0$	$D < 0$	2	1	1	3.

The second of these series of conditions are incompatible; since, if $a > 0$, $A > 0$,

$$40ac = A + 12a^3 + 45b^2, \text{ and } c > 0;$$
$$\therefore D = 4cA^2 + 2aB^2 - A(2aC + 3bB)$$
$$= 4cA^2 + 2aB^2 + 4cA(2a^3 + 45b^2) + 24a^2b^2A$$
$$> 0.$$

It follows that if $X_5 > 0$, there must be either five real roots, or only one; and there are five only when, at the same time, $a < 0$, $A > 0$, $D > 0$. When $X_5 < 0$, there may be one real root, or three real roots, but no more; and there will be three when, at the same time, either

$$1°,\ A < 0,\ D < 0,$$
$$\text{or } 2°,\ a < 0,\ A > 0.$$

To find the nature of these roots: if $x = 0$, the polynomials become

$$X = d,\ X_1 = c,\ X_2 = -5d,\ X_3 = C,\ X_4 = E,$$
$$X_5 = BDE - CD^2 - AE^2.$$

Let k be the number of changes of sign in these quantities, which is evidently not affected by any change in the sign of c, and m' the number of *positive* roots in the equation $X = 0$. Then will $m' = i \backsim k$. But since, when there is only one real root, its sign, from simple considerations, is opposite to that of d, we need only examine the two cases of five real roots, indicated by $X_5 > 0$, and $i = 0$; and three real roots, indicated by $X_5 < 0$ and $i = 1$. Then we may form the following Table of conditions:

when

			$X_5 > 0$ and $i = 0$		$X_5 < 0$ and $i = 1$	
$d > 0$	$C > 0$	$E > 0$	$k = 2$	$m' = 2$	$k = 3$	$m' = 2$,
"	$C > 0$	$E < 0$	4	4	3	2,
"	$C < 0$	$E > 0$	2	2	3	2,
"	$C < 0$	$E < 0$	2	2	1	0,
$d < 0$	$C > 0$	$E > 0$	1	1	2	1,
"	$C > 0$	$E < 0$	3	3	2	1,
"	$C < 0$	$E > 0$	3	3	4	3,
"	$C < 0$	$E < 0$	3	3	2	1.

Then, when there are five real roots, and $d > 0$,
4 of them are positive and 1 negative, when $C > 0$, $E < 0$;
2 of them are positive and 3 negative, in all other cases;
when there are five real roots, and $d < 0$,
1 of them is positive and 4 negative, when $C > 0$, $E > 0$;
3 of them are positive and 2 negative, in all other cases;
and there cannot be five positive roots, as we know from the circumstance that their sum $= 0$.

Also, when there are three real roots, and $d > 0$,
all of them are negative when $C < 0$, $E < 0$;
2 are positive and 1 negative, in all other cases;
when there are three real roots, and $d < 0$,
all of them are positive when $C < 0$, $E > 0$;
1 is positive and 2 negative, in all other cases.

We may state, moreover, from the mere inspection of the polynomials, that when $X_5 = 0$, there are two equal roots; that when $D = 0$ and $E = 0$, there are two pairs of equal roots; that when

$D=0$ and $E=0$, and at the same time $B^2=4AC$, there are three equal roots, &c.

EXAMPLE.

In the second example given by Mr. Davies, in the Prize Question of last Diary,

$$X=x^5-10x^3+6x+1=0;$$
$$\text{or } a=-10,\ b=0,\ c=6,\ d=1;$$
$$\therefore A=9600,\ B=-500,\ C=-2400;$$

or we may take $A=96$, $B=-5$, $C=-24$.

Then $$D=43651,\ E=10920,$$

or we may take to calculate X_5, $D=4$, $E=1$, and we find

$$X_5=272>0.$$

So that $a<0$, $A>0$, $D>0$, $X_5>0$, and there are five real roots. Also, since $d>0$, $C<0$, $E>0$, two of these roots are positive and three negative. By writing down the polynomials whose coefficients are here calculated, we shall immediately find the initial figures of these several roots. There is one between 0 and 1, one between 2 and 3, two between 0 and -1, whose initial figures are —, 1 and —, 6; and one between -2 and -3. Mr. Horner's method may now be employed to approximate to these roots.

*** The Editor has before mentioned, and again begs leave to recommend to English readers Mr. Spiller's translation of Sturm's valuable disquisition.

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Charles Gill—The First Actuary in America.

(Third Paper)

EMORY McCLINTOCK.

Reprinted from Transactions of the Actuarial Society of America, Vol. XV, Part I, No. 51. May 21st and 22d, 1913.

Mr. S. H. Jaffe

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CHARLES GILL

[Reprinted from the TRANSACTIONS OF THE ACTUARIAL SOCIETY OF AMERICA, Vol. XV, Part I, No. 51.]

CHARLES GILL—THE FIRST ACTUARY IN AMERICA.

(THIRD PAPER.)

BY

EMORY McCLINTOCK.

ST. PAUL'S COLLEGE, FLUSHING.

The previous paper was broken off in the midst of Gill's progress as a mathematician at St. Paul's College, Flushing, and the reader is requested to recall the earlier part of his career: his birth as a poor boy in Yorkshire, England, October 22d, 1805, his rise to the command of a vessel under remarkable circumstances at the age of sixteen, his beginning as a teacher in the village of Ganton, and his taking a place at once as a solver of problems; followed by removal to Hessle, where he continued to teach and to solve more problems; his acceptance of a better place at Seamer, where he prospered until, in 1830, he boldly ventured to emigrate to New York with his little family; his engaging as teacher at the Saw Pits Academy, Rye, N. Y., where he attracted notice quickly as an extremely successful solver of problems; afterwards taking a place in the faculty of St. Paul's College under its president, the distinguished Dr. W. A. Muhlenberg, soon becoming the leading spirit of the active mathematicians of the United States. While in this work, it will be remembered, he conducted the *Mathematical Miscellany*, which ran on successfully for four years, stopping after issuing the last number in the year 1839.

The cessation of the appearance of the *Mathematical Miscellany* must have been felt keenly by those who were interested, prominent among whom was Professor Benjamin Peirce, of Harvard University. Peirce was already recognized as the foremost of mathematical writers, his text books being in their way classical, and his contributions to the *Miscellany* of every kind were second to none except those of Dr. Strong. There was no one to take Gill's place when the *Miscellany* was discontinued, and there was no mathematical periodical for two or three years after its unexpected fall, although

there had been previous attempts of the kind since about 1820, but until the beginning of the *Analyst* many years later, the gap was never filled, with one solitary exception, as far as my knowledge goes. This venture occurred in the month of April, 1842, started by Peirce himself. It was named the *Cambridge Miscellany.* This publication survived only for one year. It was published quarterly, the last number being that of January 1, 1843. The name of *Miscellany* was continued, or borrowed, by Peirce, and the first number began with a problem attributed to "Math. Misc." in "the Junior Department of Mathematics" which was continued by Peirce in exactly the same way as in the *Mathematical Miscellany,* dealing with the same subjects, and having the same class of contributors, devising the same kind of problems, and addressed to the same class of students, as its predecessor. Considering that all previous attempts to furnish a medium for problem-solvers in this country, as in England, had been offered to the public indiscriminately, until Gill made his successful effort in the *Mathematical Miscellany* to excite and keep up an interest avowedly among students only by making a separate department for Juniors, I might call this plagiarism, it being an attempt to make it appear that the *Cambridge Miscellany* was, in some sort, the successor to the earlier *Miscellany.* Gill took no exception to his *Miscellany* being copied, although no direct reference was made to the latter, except to make extracts, which was freely done, with due credit. Gill in fact contributed much to the success of the new enterprise, in the way of devising new problems, as well as solving those of others, of course in the Senior Department, which regularly, as of old, followed the Junior in each issue.

In the Junior Department there were five problems brought forward, each of which was credited to the *Mathematical Miscellany,* and in the Senior Department, six problems, all six giving the same credit. The answers to the eleven problems are so plentiful that it may be inferred that Gill gave Peirce his list of replies from the subscribers to the *Mathematical Miscellany,* because otherwise there must have been infinite trouble in the necessary correspondence from the Cambridge office, to which Gill's intervention would also have been necessary, in supplying the list of subscribers. Perhaps both were supplied by Gill. I judge it most probable that the latter was the case. I have not access at this time to the copy of the *Mathematical Miscellany* which I had before me in writing the second paper.

The *Cambridge Miscellany* continued in each number the Junior and the Senior Department of Mathematics, and also an additional feature, contributed after the first number by Professor Lovering, on astronomy and physics. There was also a section on meteorology, usually clippings, translated if necessary, from one or another European authority. The most important article in this first number is by the editor himself, it being really a résumé of what had been done in America up to date by her astronomers. The beginnings of the National Observatory in Washington are stated with some hesitation (it had not yet been founded) but with a cordial recognition of the work actually done, under Lieutenant Gilliss.

There was printed on pages 12 to 14 a solution of a problem by "Prof. C. Gill, St. Paul's College," on page 18 the solution of another by Gill, and on pages 20, 21, that of a third. All of the six questions were stated to have been answered separately by Avery, Catlin, Gill, Perkins, Root and Strong.

To the second number, which appeared on July 1, 1842, Gill contributed various problems to be answered in the Junior Department of the fourth number, issued January 1. Both Gill and Strong answered all of the five questions given for the Seniors, and no one else appears to have answered more than four. Gill's name appears this time with the initials A.A.S. (American Association for the Advancement of Science), which were also appended to several other names of competitors. If the Actuarial Society had been in existence and had the name "American" been prefixed, as at one time was proposed, Gill's name would have been in it, with those initials, at that early period.

In the third number, that for October, 1842, Gill gave a problem for solution by April, 1843, for Juniors, and Gill and Strong each answered all the five questions in the Senior Department, while for some reason the familiar names of Avery, Catlin, Perkins, and Root were not among those competing. There was some reason for dissatisfaction, which could not be attributed to Gill at any rate. The recalcitrant gentlemen did not present their names for the fourth number as well, which was the last opportunity afforded to competitors by the *Cambridge Miscellany*. The problems given out in advance for the fifth and sixth numbers were not answered at all—the fourth number, that for January, 1843, was, as before stated, the last issued, no notice being given for the stoppage.

Peirce himself was not able to carry on the work for so long a

time as Gill, the one year of the *Cambridge Miscellany* being the limit of Peirce's editorship, as against the four years of Gill's, and each publication stopped without notice to the subscribers. The backing of Harvard University was not officially given to Peirce at that time, although the prestige of its name was necessarily given, with that of the leading mind of its mathematical department.

Gill's Career Interrupted.

In the year 1848, the circle of professors forming the faculty of St. Paul's College was broken up; the probable cause being shortness of money, as is frequently the case with such institutions when unendowed and otherwise devoid of abundant financial backing. The difficulty was prudently kept as much as possible from the public. Years later, after Gill's death in 1855, Dr. Muhlenberg gave this apparent explanation concerning the termination of Gill's connection with the college:

"In August, 1848, he left College Point, determined to relinquish teaching and adopt some other employment, where he could be more useful; in the meantime he accepted the employment of discount clerk of the Atlantic Bank."

The foregoing explanation is obviously lame and inconclusive. The mathematical career of Charles Gill in England and the United States, successfully carried on in both countries for twenty-five years, could not possibly be broken up for any so flimsy a reason as "that he could be more useful in some other employment than teaching." President Winston's brief sketch, formal as it was, is more satisfactory. He says of Gill's losing his connection with St. Paul's College "This connection was only severed, as a necessity, by the removal of Dr. Muhlenberg to the parish of the Holy Communion, in New York."

Gill's position was certainly very embarrassing. His little family had no other means of support, and the fact was that he was thrown out, with no other chance of employment than a minor bank clerkship. The place that he took "in order to be more useful" than that which he was leaving, was probably, in the eyes of his neighbors in Flushing, a more promising one, with the chance of his becoming a rich banker. We may suppose that he talked the matter over from all points of view with his guide and patron, the president of the college, Dr. Muhlenberg, who must have given him the best information at his command concerning the bad outlook of the

tottering institution, as he himself was about to quit it forever. Probably Gill's small salary had been cut down already, if not more than once, for reasons too well known in the little community of professors, which could not be prudently made public at the time. To the salary of a discount clerk from that of a professor in a college, already small, since the institution was pinched for money, could not have been much of a descent, and Gill was ready to make it. What could be said publicly about it? There were many friends of Gill in other places who would be amazed at the change, regarding it much as we would have done. If it were to be done, Gill doubtless had an understanding with Muhlenberg that the statement should be made that Gill resigned his place for personal reasons. It might have been published at the time, in 1848, that he "relinquished teaching for another employment in which he thought he would be more useful." Dr. Muhlenberg might have, therefore, made a statement at that time "that Gill had given up teaching because he thought he could be more useful in another position" and this would not have been so objectionable. No public statement whatever seems to have been made for seven years, until after Gill's death, that above stated as first as given by Muhlenberg, which he supposed to have been authorized by Gill himself at the time, was brought forward in good faith by the former president of the college. It was an astonishing lapse, both of memory and of good manners, coming from a firm friend of Gill's, and one so accustomed to the use of language as Dr. Muhlenberg, to assert that the reason of the change was "he could be more useful in some other employment than teaching." The implication that Charles Gill had been of no use as professor of mathematics at St. Paul's College during those fifteen years would have been received with horror by Muhlenberg himself.

When Did he Think of Life Insurance as a Calling for Life?

The interesting question is, at what time and how did the idea of becoming an actuary occur to Gill's mind? My opinion is, that he may have had the idea before he left England. His knowledge of life insurance in England before 1830 would, of course, be limited, both because there were so few companies, and because of his limited acquaintance and opportunities for travel. There is small possibility of his having been in London, or in any other

large place excepting Hull, and Liverpool whence he probably sailed to New York. His knowledge of life insurance must have been derived from books and possibly from such acquaintances as may have known of the already surprising success of the Equitable of London. The doctrine of annuities given by Baily was probably his chief text book and the *Post Magazine* his only insurance periodical.

My opinion is a surmise based on two facts; one the fact that he was an ambitious, enterprising man, who was looking out for opportunities of increasing his livelihood, and had in a way become, in 1848, acquainted with the rudiments of such things as are known to actuaries; and that he was probably the owner of a copy of Baily or some other similar work before starting for America. The other is the fact that Professor Davies, "Auditor" of the Gresham Insurance Society, was conscientiously able to write soon, in 1849, so strong a letter commending Gill as an actuary. This letter is referred to further on.

The chance of gaining wealth as a banker may have seemed to him much greater than it was, and he could at least earn a small competence by accepting the offer and look about for some permanent place, in some established life insurance company, or start a company of his own. The example of the great English actuaries, who had like him a mathematical turn of mind, was before him, these actuaries having been at first the leading officers, or managers, of such British companies as had been successful.

What is an Actuary?

We must always remember the different meaning which has become attached to the word "actuary" for more than forty years, replacing the meaning formerly given to it. The Standard Dictionary, which is the present standard in this country, defines the word as "an officer, as of an insurance company, who calculates and states the risks and premiums, computes mortality tables, etc." The dictionaries used to give a different meaning, probably derived from English usage, which led many to ask me when I first began in my profession in 1868, "What is an actuary?" and no one could answer the question, which must have also puzzled many of my colleagues of the early days.

The first use of the word actuary was for the manager of a life insurance company, corresponding in England to an American

president. The title is etymologically vague, as it could be applied to any business. The definition given to the word in March's great Thesaurus Dictionary, which is probably the largest and best of American dictionaries, is simply "clerk," and as one branch of clerical occupation, under the sub-division of "Accounts," is "the calculating officer of a life insurance company." When the Equitable of London was organized, the directors had to have a clerk, and there was no other name so dignified to give to its clerk as actuary, or at least that is my supposition. The usage crept in of applying the title to every English manager of a life insurance company. In this country, the New York Life Insurance Company was preceded by another company of the same name, the New York Life Insurance and Trust Company. This old company is still in existence, although it has been in fact for many years a leading Trust Company exclusively.

Is an Actuary the Manager of a Life Insurance Company?

"The first actuary in America," before Gill, was a purely nominal officer, called, according to the English custom, actuary, though without an understanding of what the word meant in America. The first to have the title was William Bard, President and Actuary of the New York Life Insurance and Trust Company, who founded the company in 1830. He employed in 1844 an English actuary, Finlaison, to make a valuation of the company's life policies.

In 1845 the New York Life Insurance Company began its existence. Its "actuary" was Pliny Freeman, who was elected in 1845, and never attempted the rôle of a mathematician. His successor as actuary, William H. Beers, took the place of a secretary for many years, acting also as the head of the department of accounts. The actuary in that company always played a more important part than in other companies, being the chief officer next to the president. The person doing the actuarial, mathematical work under Mr. Beers was Preston S. Lincoln, who kept in the background for many years until his death.

This was, therefore, the situation in April, 1849, when Gill gave up his clerkship in the Atlantic Bank, which he had taken in August, 1848. He was, therefore, as I called him in my title, the first actuary in America, as actuaries are now known, namely, as I venture to define it, the mathematical officer of a company. I

give this definition with some hesitation, knowing that it is liable to some immediate improvement at the hands of the members of the Society who hear this paper read, probably a change for the better, which none will welcome more gratefully than myself. Perhaps a broader and more comprehensive definition would be, mathematical expert, without involving connection with a company. The choice of a definition must depend on the use to be made of it.

Mathematician of the Mutual Benefit Life Insurance Company.

It was not until April, 1849, that any American company had a mathematical officer or, as we should now say, an actuary, when the first of the men who would now be contained in the Actuarial Society was named Mathematician by the Mutual Benefit Life Insurance Company, in the person of Charles Gill. On April 16, the board of directors of the Mutual Benefit Life Insurance Company passed the following resolution regarding the appointment of a Mathematician for the company:

"*Resolved,* that it is expedient for the company to employ a competent person as mathematician of the company, and that having great confidence in the testimonials and other information received as to the character and ability of Charles Gill, it is further

"*Resolved,* he be appointed a mathematician of the company, and to discharge such other duties as may be assigned to him, at a salary of $1,000 per annum."

For this extract I am indebted to my friend, the present Vice-president and Mathematician of the company, who is also a well-known Fellow of the Society, E. E. Rhodes, who has been throughout this period of two years one of my frequent correspondents, and has shown himself at all times ready to give me aid and advice on points which have arisen involving some doubt and perplexity.

Concerning the "testimonials" mentioned in the resolution of the Mutual Benefit, I can give no information, as no record seems to have been preserved. Yet two strong testimonials happen to have been given within the succeeding month of May, which were intended for the information of the directors and which certainly were useful to Gill six months later, when he had occasion to present them to his future employers. They consist of two strong endorsements by personal friends of Gill, Professors Peirce of Harvard, and Davies of the Royal Military Academy at Woolwich, in England, which are given below. The first is as follows:

"HARVARD UNIVERSITY, 9 May, 1849.

"*My dear Friend:* In answer to your inquiries, I am happy to be able to state that I have known you as a mathematician for many years. I was familiar with your contributions to the Mathematical Miscellany when you were its editor, and afterwards when I was editor myself. I have repeatedly tried the strength of your geometrical capacity, both in conversation and writing; and I am able to say, with entire confidence, that you have not your superior, as a mathematician, in the United States, either in powers of analysis or in elegance of solution. I can say, moreover, that there is no known subject of mathematical computation, either theoretical or practical for which you are not fully competent; and I can add that all the problems of life assurance will be as simple to you as a sum in the rule of three is to most of those who are usually known as mathematicians.

"Very faithfully and sincerely,
"Your friend,
"BENJAMIN PEIRCE."

"Prof. Gill.

"P. S. I am delighted with your Treatise on the Angular Analysis; it is truly a gem. I entreat you to come to Cambridge at the meeting of the Scientific Association in July.—B. P."

"ROYAL MILITARY ACADEMY,
WOOLWICH, May 26, 1849.

"*Gentlemen:* It is with sincere satisfaction that I depart, in the present case, from my usual rule (one rendered necessary by the position I have the honour to occupy) of not giving indiscriminate or ill deserved testimonials. To Mr. Gill I can most conscientiously do so, and therefore do it with the pleasure which I must ever feel in paying a just tribute to high talent and extensive learning.

"Mr. Gill and I have never met, but we made our appearance in public, as mathematical writers about the same time, and partly in the same works. His very remarkable power in treating problems of a higher order than those usually attempted at our age, attracted my attention strongly, and my eye has been kept constantly on his writings with great improvement to myself. He had fully maintained his early character for great originality, and unfailing resource in the most difficult investigations. Indeed, did any diffi-

culty occur in my own researches that I deemed it necessary to refer to another mathematician, there were few men living to whom I should refer it with the same confidence of receiving efficient aid, in a full and original form, as Mr. Gill. In England he is considered to be the first of the mathematicians of America.

"This, however, refers to his mathematical powers and acquirements generally. There is, as you must be aware, a peculiarity of character in the mathematics of contingencies, whether it refers to insurance, to general statistics, or to mere games of chance. Many of its problems are of extreme complexity; and cases often occur that require the most refined methods of investigation, and indeed, altogether new ones.

"I have looked much into this class of researches myself, and am consequently able to judge of the kind of powers which they require. In speaking, therefore, of Mr. Gill, I am in a condition to speak positively as to the peculiar fitness of his mind (as developed in his writings) for entering upon them with complete success. Indeed, as far as my knowledge of American mathematical literature extends (and that acquaintance is not very limited) I consider that through the whole Union might be sought in vain anyone that could be proposed as his equal.

"It is a remarkable fact in the history of insurance in this country, that the most distinguished actuaries were men who had never been in any way brought up to any office of the kind. They have, however, invariably been eminent for their mathematical powers and acquirements; and under their control, the Offices who employed them have as invariably prospered. By such men, the mere business details that fall properly under the cognizance of the actuary are easily mastered.

"In conclusion of a longer letter than is usual (and there is not time to condense it before the mail is made up) I may be permitted to remark, that the actuary must enjoy the entire confidence of the directors, and be possessed of an entire knowledge of the whole affairs of the company. Without this, his data would be imperfect, and his conclusions necessarily erroneous in proportion to the defects of the data. I can have no doubt that Mr. Gill will be able to show you that he deserves that confidence; but the absence of all personal knowledge precludes me from being able to speak on this point. But of one thing I feel certain—that, without that con-

fidence, neither Mr. Gill nor any other actuary will be of the least use to the interests of the Society.

"I have the honour to be, Gentlemen,
"Your very obedient Servant,
"T. S. DAVIES, F.R.S.

"Lond. and Edin. F.S.A. &c. Professor of Mathematics R.M. Academy, and Auditor of the Gresham Insurance Society, London.

"The Directors of the Mutual Benefit Life Insurance Company, Newark, N. J."

The minutes of the board of directors of the Mutual Benefit Life give much information on Gill's brief career in that institution. I give the summary, first, drawn up by Mr. Dodd for Mr. Fackler and by him stored away in his treasure house of memoranda, kept to aid his memory, which is itself always ready at the call of the Society, and which has frequently been put freely at the disposal of his friends, one of whom I am proud to be counted. I am indebted to him for his recollection of Gill's record in the Mutual Life office, and he has sent me also a copy of some memoranda sent him on June 15th, 1908, by Mr. Dodd, lately Vice-president of the Mutual Benefit. He says: 'I obtained the following data from Amzi Dodd, who kindly went through the minutes of the board meetings of the Mutual Benefit Life, and wrote down all he could find.' Below is a copy of the memoranda he gave me:

"MEMORANDA OF AMZI DODD, RECEIVED JUNE 15TH, 1908.

"April 16, 1849—Gill appointed Mathematician.
"July 25, 1849—Gill calculated dividends.
"July 25, 1849—Gill given duties of agency clerk."

I copy the last three lines verbatim, leaving the rest till later. Mr. Rhodes supplied the copy of the minutes first given of Gill's appointment, and also several amplifications of the memoranda from the same minutes, which will be given in order successively. The first of the data given by Mr. Dodd, as above, for July 25, is expanded into the resolution copied by Mr. Rhodes, of that date, as follows: "That Mr. Gill be requested to calculate, at his convenience, the dividends for 1847 and 1848, and report the result to

this Board." Concerning the "duties of agency clerk" Mr. Rhodes is not so explicit as Mr. Dodd, his statement being "that, July 25th, 1849, the duties which had been performed in the Home Office by a Mr. Whitman were transferred to Mr. Gill." He also states that "under date of October 15th, 1849, the Board increased Mr. Gill's salary to $1,500, at the same time he was requested to prepare the tables of rates of premium." Hereafter I shall give, first prefixed by the letter (D) the data of Mr. Dodd's memoranda and followed at once by Mr. Rhodes's fuller statement, or abstract from the minutes, indicated by the letter (R) in parenthesis.

(D) November 20th, 1849—Gill resigns.

(R) On November 20th, 1849, Mr. Gill's letter of resignation was read and accepted. "To the Board of Directors of the Mutual Benefit Life Insurance Company. Gentlemen, Certain unforeseen events in my family, and some modifications in my views for the future, have rendered it necessary for me to resign my situation as Mathematician of your Company.

"If it should meet with the approbation of the Directors, I should wish the resignation to take place on the 31st January next, as I cannot before that time fully complete the calculations and arrangements which I have commenced for the Company, and the Directors will probably wish as much time to select a suitable successor.

"I beg leave to return my thanks to you, Gentlemen, for the uniformly kind and courteous manner in which you have treated me, and shall always feel a lively interest in the prosperity of the Mutual Benefit Life Insurance Company.

"With much respect, Gentlemen, I am, your obedient servant,

"C. GILL.

Newark, Nov. 20th, 1849."

(D) January 28, 1850. Gill engaged at a salary of $1,500, and empowered to sign certificates.

(R) On January 28th, 1850, the following resolution was passed:

"*Resolved,* That, in payment of Mr. Gill's salary, the Treasurer be instructed to allow him at the rate of $1,500 per annum for the time he has served the Company."

(R) On the same date the following resolution was passed:

"*Resolved,* that Mr. Gill be requested to sign the statement as Actuary."

Mr. Dodd was wrong concerning January 28, 1850, and in implying that Gill had withdrawn his resignation of November 20th. He supposed that the Board fixed the salary on January 28, not having noticed the date on which the salary had been named (Oct. 15) at that amount, only about a month before the date of his resignation. Mr. Rhodes corrects this misapprehension, and gives the exact facts as to the salary, which was really originally first fixed at $1,000 and raised to $1,500 and dated back six months from his entrance as Mathematician. Concerning the last resolution of that day, "that Mr. Gill be requested to sign the statement as Actuary" Mr. Rhodes gives the following explanation:

(R) "In 1850 the *Life Assurance Examiner,* a periodical then conducted by an agent of the Mutual Life Insurance Company, contained attacks on the company. Mr. Gill prepared a statement showing the falsity of the attack in the *Examiner,* according to the minutes of July 15th, 1850."

Meantime, early in 1850, Gill changed his position to that of Actuary of the Mutual Life, apparently with the good will of all concerned, certainly with the best wishes of those whom he was leaving, as the records show. He apparently did work for both companies for some months, and the account of his connection with the Mutual Life must be left till later.

An Agent of the Mutual Life Attacks the Mutual Benefit.

The attack mentioned in the preceding paragraph was answered by the company on July 10, 1850, in accordance with the minutes of January 28, by Gill, whose name, however, does not appear in the answer. It takes the form of a sixteen page pamphlet in a light green cover, addressed "to the members of the Mutual Benefit Life Insurance Company," the cover serving as the only title page. The only copy to be found in the office of the Mutual Benefit has been lent to me temporarily by Mr. Rhodes, and I give herewith such facts of it as seem to be either written by Gill, or may have been written with his collaboration. This account is business-like and dignified, beginning as follows:

"At a meeting of the Directors of the Mutual Benefit Life Insurance Company, held May 7, 1850, it was

"*Resolved,* That it has been the policy of this company to treat

with the greatest respect institutions organized for similar purposes as our own; and that the officers and agents of this company have been required to abstain from all disparaging remarks against other respectable life insurance companies.

"*Resolved,* That entertaining, as they do, a sincere respect for the Mutual Life Insurance Company of New York, the directors learn with regret that an individual prominently connected with that company continues publicly to attack the principles and management of this institution, by which the two companies are made to appear as open and direct antagonists of each other.

"*Resolved,* That the publication in *The Life Assurance Examiner* of attacks upon this company, tend to destroy that comity of feeling which should exist between two associations organized for the same objects, and that the want of candor and fairness manifested in such articles we are assured cannot meet the approbation of the trustees of the Mutual Life Insurance Company of New York; while the general tendency of such articles, coming as they do through the medium of a periodical published by an authorized agent of that company (stating in many instances that which is not true) must be to destroy in a great degree the confidence of the public in all life insurance companies.

"*Resolved,* That a copy of these resolutions be sent to the Mutual Life Insurance Company of New York, with the request that the matters contained in them be submitted to their Board of Trustees for such equitable action as shall to them seem proper.

"On motion, *Resolved,* That Seth Low, Isaac H. Frothingham, and Edward Anthony, be a committee to present the above resolutions, and with full power to act upon any communication that may be received from the Mutual Life Insurance Company of New York.

"A true copy,

"B. C. Miller, *Sec'y.*

"The Committee to whom were referred the foregoing resolutions, present the following Correspondence and Report:

"Correspondence.

"Joseph B. Collins, Esq.,

"Pres't Mutual Life Ins. Co.

"*Dear Sir,* Annexed we hand you resolutions which were passed by our Board at their meeting yesterday, with the request that you

will lay the same before your Board of Trustees, which we understand will meet to-day, and with the hope that they will receive such just and equitable action as the case requires.

"We are, yours most truly and respectfully,

"SETH LOW,
ISAAC H. FROTHINGHAM,
EDWARD ANTHONY,
Committee."

"New York, May 8, 1850."

"OFFICE OF THE MUTUAL LIFE INSURANCE CO. OF NEW YORK,
35 WALL STREET, NEW YORK.

"May 10, 1850.

"MESSRS. SETH LOW, ISAAC H. FROTHINGHAM, AND EDWARD ANTHONY,

"*Gents:* Your communication of the 8th inst., with the accompanying Resolutions of the 'Mutual Benefit Life Insurance Company,' I have received; and in conformity with your request laid the same before our Board of Trustees at their meeting held on the 8th inst.

"I sincerely regret, gentlemen, that there should ever have been any cause of unfriendly feeling between the institutions we are attached to, and desire that there may be none hereafter.

"And I am instructed by our Board to disclaim all control over, connection with, and responsibility on account of the publication referred to in your communication.

"With sentiments of respect,
"I remain very truly yours,
"JOSEPH B. COLLINS, *Pres't.*"

The Reply of the Mutual Benefit follows:

A TART REPLY: THE MUTUAL LIFE MYSTERY.

"*Report.*

"An attack having been made on the plan and experience of our company, in a publication bearing the title of 'Johnston's Life Assurance Examiner,' the directors have confided to us the consideration of what action it is proper to take on the subject.

"The connection of the author of these charges with a highly respectable life assurance company, in Wall Street, might give a character of respectability to the charges were the fact not made known to the public, that the company in question, its directors and officers, in the broadest and most unqualified manner, deny any connection with the publication, and repudiate the sentiments therein contained.

"Although the directors of the company disclaim all control over the publication, and all responsibility for its contents, the public, nevertheless, from the general tone of the articles, attach an importance to the communication, whereby the publication acquires a factitious value, rendering it more injurious to the parties against whom the virulent attacks in its pages are directed.

"It becomes necessary, therefore, to meet this attack before the public to whom it is addressed; and in doing so, we shall endeavor to keep out of view, as far as possible, every personal consideration. It is difficult to do this when every line of the article exhibits a degree of personal malignity, for which it is not difficult for one to account, but which it would be unworthy of us further to notice."

The *Life Assurance Examiner* appears to have been published quarterly, or semi-occasionally, by J. C. Johnston, well known as the New York agent of the Mutual Life, who was probably the most successful solicitor for life insurance applicants employed by that company in its first twelve or fifteen years, without excepting Mr. Henry H. Hyde, the noted agent at Boston, and father of the founder of the Equitable of the United States. Johnston retired with a small fortune before the civil war, and settled in Rock County, Wisconsin, where he shortly embarked in a new enterprise, no less than the founding of the Mutual Insurance Company of Wisconsin, which after some changes, but keeping the same charter, which was a reproduction of that of the Mutual of New York, became the Northwestern Mutual Life Insurance Company, of Milwaukee. Nothing is known of the attack on the Mutual Benefit, except what is derived from the pamphlet referred to, which I shall here call the Reply. I gather that it contained a strong attack on the "note plan" of life insurance, which the older members of this Society are familiar with, and which will be explained as we proceed for the benefit of the rest. A half century ago, the air was filled with publications on this subject. Our readers may imagine the rejoinders. This of Johnston's may have been the first gun, and

the warfare went on, between the all-cash companies and the note companies, for about twenty years in the fifties and sixties of the last century. The cash companies were the Mutual Life and the Equitable, founded by H. B. Hyde, formerly cashier of the Mutual Life and perhaps as such interested in the "cash" side of the question, who threw himself vehemently into the contest.

The "note companies" were far more numerous, and made up the opposition to the two first named. About all of the American companies did much of their business on the "note plan," and their business was large, as may be seen in inspecting the records.

The first extract from the attack given in the Reply was the following:

"'By the terms of the Mutual Benefit Society, as stated in their prospectus, twenty five per cent. of their premiums must be paid in cash, and seventy five per cent. may be paid in notes.'

"Let it be recollected that this is published in April, 1850, and let the reader compare it with our Prospectuses of 1848, 1849, and 1850, the last of which was published some months before the '*Life Assurance Examiner.*' In these it is stated in distinct terms, 'premiums on policies for life, if over fifty dollars per annum, may be paid as follows, viz.: *One half in cash,* and one half in a satisfactory note, at twelve months, bearing interest at six per cent. per annum. Premiums on all policies, *for a less period than the duration of life, must be paid in cash.*' Yet every line of the article is written as if the writer were entirely unconscious of this statement, and the writer has the further assurance to say:

"'This,' that is, the examining 'in detail' the reports of the Mutual Benefit Company, 'will fairly (!) illustrate the working of the plan, and give a basis from which to calculate results.'

"Again:

"'The business scheme of the company assumes that twenty five per cent. in cash is all that is necessary for the purpose of insurance, and the prospectus so informs us.'

"On the contrary, so long as this basis was retained by the company, the language in all the published documents was the same, viz.: 'The premium, if over fifty dollars, can be paid, one-fourth in cash and three-fourths in a secured note, at twelve months, bearing six per cent. interest and *subject to assessment if required.*' (See the Prospectuses of 1845, 1846, and 1847.) The very notes signed by the members of the Company, have from the beginning been

made in all cases 'payable in twelve months after date *or sooner, if required to meet assessments of the company..*'"

The Reply states on page 9 that

"The result of the deliberations of the directors on this momentous question was a resolution of the Board dated January, 1847, 'that on renewal of all notes due on and after March 1, 1847, an assessment of fifteen per cent. should be made.'

"It will be easily understood that this annual assessment of fifteen per cent. on the accumulating notes, if continued for a length of time, would continue to decrease the ratio of the note to the whole amount of premium; and it became a question how far it was necessary for the safety of the Company to carry this reduction. After careful consideration of this question, it was concluded that the assessment should be continued until the note was reduced to fifty per cent. of the whole amount of premiums paid. To simplify the vastly increasing business of the company, it was determined that all new Life members admitted, should commence on this basis, and pay not less than fifty per cent. cash on every premium. This arangement, as previously stated, took place May 1, 1848."

Several pages of the Reply are taken up with statements about the note plan which might or might not have been written by Mr. Gill, but Gill was consulted, at least, in the following:

"We are happy to state that our conclusion in this respect has been hitherto verified by our experience. Our cash funds have steadily increased from year to year and a calculation undertaken by a competent Mathematician, who during the year 1849 performed the duties of *actuary of the company,* conclusively proves that unless the mortality in the company should be vastly greater than any experience has shown, their cash funds must continue to increase for a long period of time, even without any accession of new members to the company."

I have italicized a few words in the foregoing.

"After remarking that the statement of the Company made January 1, 1849, somewhat less than four years from its commencement gives its entire assets less than five per cent. of its liabilities, the writer of the *Examiner* goes on to say: 'It is not necessary in life assurance that the present capital should at any time be equal to the prospective claims upon it; but the disproportion should never be so great as to give to the assured reasonable occasion for alarm. When this occurs, it is evident that there is some radical and fatal error

in the system which has induced it. In the case before us, apart from the inconsiderable amount of the assets, their character is to be considered.'

"Here, again, the author has placed himself on the horns of a dilemma. Notwithstanding the air of plausibility thrown over the language, he is either ignorant of the principles of life assurance, in which case his attempting to dictate to the community on the subject exhibits the extremity of impudence; or he does know them, and wilfully and deliberately insinuates a falsehood for malicious purposes.

"That our assurers may have no 'reasonable occasion for alarm,' either on account of 'the inconsiderable amount of the assets,' or 'their character,' we beg to state to them what the writer in the 'Examiner' either knows, or ought to have known before presuming to write on such a subject.

"The formulas of assurance show, and in fact any ordinary accountant can convince himself of the fact by a very simple calculation, that if all the members of our company had taken life policies on the day the first policy was issued, paying the usual annual instalments, and had the claims occurred as predicted by the tables of mortality on which the rates are founded, the commissions and other expenses amounting to ten per cent. of the gross receipts, our assets on the first of January, 1849, would have been less than four per cent. of the whole 'prospective claims.'

"Our experience, then, has been in all respects better than we had any right to hope for. Instead of our policies being all for life, probably one-fifth of them were for terms of seven years or less, and consequently paid a much less premium; instead of their all having paid four premiums, only about one-tenth of them had paid four premiums, while one-fourth of them had only paid one premium; and yet, at the end of four years, our assets had accumulated to nearly five per cent. of the liabilities. No more striking proof could be given, not only that the company was very fortunate at its commencement, but that its affairs have been prudently and economically managed: and we have no doubt that if any of our company have felt disturbed at the insinuations of the *Examiner*, they will now see that they have no 'reasonable occasion for alarm.'

"With regard to the 'character' of the assets, the writer says, speaking of the premium notes and loans on scrip,—'What may be the real value of these last two items, amounting to $470,108.25,

neither we nor the gentlemen who manage the affairs of the company can say; but to pretend that the whole, or the half, will ever be collected, would be an insult to the understanding of every man to whom such an assertion was addressed.'

"Happily, 'the gentlemen who manage the affairs of the society' are not quite so ignorant as he supposes them to be. These premium notes, whether in themselves worthless as waste paper, or valuable as the promissory note of a Rothschild, are of all the value to the company that their face imports. If a member surrenders his policy, its value to the company can never be much less than the amount of his note; it will soon be greater, should the society flourish, as we trust it will; and thus the note is cancelled by the act of surrender. If he remains till death a member of the company, his note is always good against the claim on his policy, since it must always be less than that claim. One of the most respectable life assurance companies of Great Britain is so fully convinced of this, that it does not require even the form of a promise to pay for the balance of 50 per cent. of premium, which it loans to the assurers.

"What is said by the *Examiner* writer on our dividend of 1847, can have no weight with the members of our own society, or even the community at large, since he plainly does not know our method of making and paying dividends; or, if he does, he carefully conceals his knowledge.

"We are charged with making a dividend of thirty-five per cent. 'as a desperate expedient to lure new customers to the office.' And this, when the dividend was made on the 1st January, 1847; the company having during the preceding twelve months issued 2314 new policies, probably twice as many as any company in the United States had ever issued before, during the same time. And this also, when companies which were starting up around us and endeavoring to compete with us, were declaring dividends of 50, 60, and even 80 per cent.

"Without, however, impugning the conduct of other companies, with which we have nothing to do, we are answerable to the community, and especially to our own members, for our own action as well with regard to the dividends of profit, as to all other business affairs of the company.

"We have declared four dividends; the three first of 35 per cent., and the last of 30 per cent. of the amount of premiums paid. Each of these dividends has been submitted to rigid mathematical exami-

nation, and we can state with feelings of conscious satisfaction, that at each dividend there has been a surplus of actual *bona-fide* profit left undivided. This surplus has been so large as to compensate in some degree for any probable future increase of mortality among the members; but not so large as to do any injustice towards the present members of the company, in favor of those who may hereafter enter it. We consider this as the only way of doing justice to all parties in a Mutual Life Insurance Company; this is the mode we have adopted, and the public may judge of its justice.

"SETH LOW,
ISAAC H. FROTHINGHAM,
EDWARD ANTHONY,
"Committee."

"Published by order of the Board,
"R. L. PATTERSON, *Pres't.*"
"B. C. MILLER, *Secy.*"

The remaining two pages of the Reply are devoted to the "Statement of the Mutual Benefit Life Insurance Company, January 1, 1850."

I spoke of the paragraph beginning "We are happy to state, etc." Gill speaks officially in such terms as make him responsible for much of what is contained in the Reply, and this bears out the wording of the resolution of the Board of January 28, "that Mr. Gill be requested to sign the statement as actuary," as completely as he could legally do it, he being at the time, May, 1850, the actuary of the Mutual Life. There is much mystery surrounding that company at the time. A violent attack had been made by its chief agent upon the Mutual Benefit, and the Reply of the latter, savage as it really was, had the air of defense against unjust attack. At such a conjuncture there was room for something terrible from the champion of the Mutual Life. Instead, there was utter silence, except President Collins's disclaimer, apologetic and complete, as told at the beginning of the Reply, of which no notice was ever taken.

MUTUAL LIFE AGENT IN DISGRACE; THE MYSTERY CLEARED.

The reason is now unfolded why the agent of the Mutual Life who was so strenuous in attacking a neighboring company had no support from his own company, the savage reply of the Mutual Benefit

being left without rejoinder as far as I can learn. The answer given by letter by the president of the Mutual Life was not only colorless, but expressed the exact truth in saying officially, on first learning what his agent had been doing, that he regretted it sincerely, and that he desired that there should be no further expression of unfriendly feeling; and in particular he was instructed by his board to disclaim any control over, connection with, and responsibility for the offending publication.

In July, 1856, years after Mr. Johnston had left the company, a report to the trustees was made at length, giving a history of Johnston's relations with the board, which were decidedly and persistently unsatisfactory. A party in the board thought that Mr. Johnston had received too much (over $30,000) for his renewal interest in commissions, and that he had been the chief instrument in the election of trustees in June, 1853, which turned out President Collins and replaced him by President Winston. The committee of 1856, which favored Mr. Winston, and of course expressed the sentiments of a majority of the board, made a report exonerating Mr. Winston of any supposed connection with the settlement made with Mr. Johnston, but held that the trustees were responsible for the election of the president, and the policyholders for the election of trustees; and said many things expressive of their disapproval of Mr. Johnston's pernicious activity. In fact, some of the trustees had become tired of Mr. Collins, and were joined by a sufficient number of new members elected by Johnston's influence with the policyholders to make a majority favorable to the scheme; and Mr. Collins found himself no longer trustee or president. The last survivor of that board told me, nearly fifty years later, apparently ignoring Mr. Johnston's existence, his favorite reminiscence of the true cause of Mr. Collins's displacement. He called on the president one day and found him preoccupied, to such an extent that he could not attend to the company's business. After fidgeting about for some time, Mr. Collins pulled out a desk drawer to show him his new invention, a little model of a mouse trap. The scandalized trustee saw no reason for keeping the secret, and proved himself a zealous servant of the policyholders, really supposing that the story had turned many friends of Mr. Collins into active opponents.

Doubtless the mouse trap story had its effect among hard headed business men, who would naturally think they had not got the right man for their president, and who were beginning to get tired of a

slow man, as Mr. Collins was afterwards called. When he was actually displaced in June, 1853, as a trustee by the policyholders, under Johnston's lead, or rather under his orders as the holder of proxies, Mr. Winston was hailed emphatically as the right man. He had been a wholesale drygoods merchant, whose misfortunes had made him the more popular among the band of drygoods merchants who were elected at that time. Mr. Collins had himself been elected more than four years before as member of the board and as president, succeeding the deceased first president, and Mr. Johnston was the very "boss" whose proxies had been efficacious in the following June in bringing two or three new members into the board, much to the distaste of the dignified early trustees. This feeling had not worn away when, in 1850, the board was astonished by the complaint of the Mutual Benefit against the same Mr. J. C. Johnston.

The board had also been aggrieved by what it decided to be Johnston's "importunity" in the matter of his accounts against the company, which he insisted were correct according to the old contract made in 1846, and never reduced to writing. These it stigmatized as unbusinesslike and unjust. The wrangle had gone on up to 1850, and the board was in the habit before that time of thinking its best agent a deplorable nuisance, when the proxy business, following the election of Mr. Collins in 1849, served to intensify the long-standing feeling against him. Possibly he, poor man, thought that he ought to be made vice-president! At any rate he obviously thought he represented the company before the public; and the issue of the *Examiner,* which had been apparently going on for years without authority from the board, was an additional sore point. The president, who was probably one of Johnston's friends, but was known to be a slow man, prompted by the board, took sides against Johnston.

Therefore in May, 1850, the Mutual Life officially "turned down" its chief agent in disgrace. Johnston's indignation presumably led to retaliation. But such questions are not in place in an account of Gill, who had not yet been taken into the Mutual Life; which was not concerned in the tempest created by Johnston's attack on the Mutual Benefit.

Work in the Mutual Benefit done in 1850 by Gill.

It is plain, as already stated, that the Mutual Benefit at any rate enjoyed the services of Mr. Gill for some months after his resigna-

tion as actuary. His relations with the Mutual Life at the time may be appropriately left for the fourth and last paper, which, I trust, will be completed in time for the fall meeting of the Society. Gill had already become "the first actuary in America" and as the pioneer of the actuaries of America he occupied a unique position as mathematician of the Mutual Benefit Life, having no rival. Mr. Rhodes gives me some further facts from the Mutual Benefit minutes. (See also Appendix E.)

(R) "On November 25, 1850, the following resolution was passed:

"*Resolved,* that the calculation of dividends and examination of the affairs be referred to Mr. Gill and the Secretary for report."

(R) "On December 10th, 1850, a communication from Mr. Gill in reference to payment of dividends of January 1st, 1849, was read and accepted."

(R) "On April 28th, 1851, the following resolution was passed:

"*Resolved,* that $250 be paid Mr. Gill for calculating the dividends of January 1, 1851, and the treasurer authorized to pay him that amount."

The company of which he was the first actuary was in 1850 relatively and actually the most important but one of all the American companies. The Mutual Life was the oldest and largest, but the Mutual Benefit was close behind it in volume of business and in amount of assets. The chief agent of the older company, Johnston, had various reasons for his jealousy of the rapid growth of its neighbor west of the Hudson, and particularly of its comparative low cost to policyholders as imagined by some of its agents; and this jealousy was quite enough to explain his apparently unprovoked attack on the Mutual Benefit at that time hardly four years old.

Gill at the Summit of his Career: His Portrait.

Gill was, as I have said, now without a rival. No other mathematical officer appeared in any company in his lifetime, which lasted five years longer, whose position could be considered equal to his own. These five years were passed congenially and fruitfully, in actuarial work of the best kind. It was at this period that he visited Boston, and of that visit a souvenir remains, in a daguerreotype from which a water color was made, which was in turn copied by photography. A photographic copy has been taken, under the watchful care of Mr. Strong, the editor of the *Transactions*. He

may personally relate the circumstances which led him to trace the daguerreotype and to have a copy taken to my great joy, and I think that a reprint of this photograph which he has enabled the Society to obtain, will delight my readers as well. (See plate herewith opposite page 34.) It is vouched for by Wm. C. Gill, the only surviving member of Gill's family, now living (1914) in Kenosha, Wisconsin.

APPENDIX E.

Reports of Mr. Gill to the Directors of the Mutual Benefit Life. First Report, Fragmentary.

If the table on page 141 (which seems to be the sum of all that Dr. Nott has taken as facts to govern his reasoning upon) be in any, the most distant, degree a representation of the actual state of mortality in the United States,—then it shows conclusively that all the life insurance companies in the United States will be bankrupt at no very distant day. For if the value of life is as great or greater at Charleston than it is at Boston, no one will dispute that it is as great at Boston as it is generally in the Northern States; and I think if it were possible to obtain a true representation of the vital statistics of the city of Boston, all insurance companies would be willing to take it as an average state of mortality in the United States north of 35° latitude. Now, it is only necessary to compare the table of mortality at Boston with the Carlisle Table, on which nearly all the rates of the companies in the United States are founded, to see that either Dr. Nott's Table for Boston is not true, or else the companies are doing a ruinous business. I have placed them on the next page.

	Charleston.	Boston.	Carlisle.
At birth	100	100	100
Surviving 5 years	68.01	53.38	67.97
Surviving 10 years	63.81	48.92	64.60
Surviving 20 years	57.12	43.63	60.90
Surviving 30 years	45.36	31.92	56.42
Surviving 40 years	34.30	21.80	50.75
Surviving 50 years	23.88(?)	14.83	43.97
Surviving 60 years	16.54	9.95	36.43
Surviving 70 years	10.10	5.77	24.01
Surviving 80 years	4.92	2.08	9.53
Surviving 90 years	1.79	.29	1.42

Rates of premium calculated from the Boston Table would be nearly double of those from the Carlisle Table, above the age of 30.

Again, if the rate of mortality at Charleston is truly represented in Dr. Nott's Tables, and if this is to be taken, as Dr. Nott argues, as not an unfair representation of mortality in the southern cities, while he himself admits that it is too favourable a representation of the country districts,—then I say that rates of premium constructed from this table of mortality would tax the Southern insurers more than they are at present taxed by the Northern insurance offices.

A mere inspection of the opposite tables is sufficient to satisfy anyone of the truth of this assertion,—at least any one who is at all conversant with the calculation of life contingencies.

Second Report, on Accumulative Policies.

Life Assurance, as a system, is yet in its infancy. The numbers assured, in the countries where it has been partially introduced, when compared with the assurable portion of the population, is sufficient to convince us that either the system is not understood or that the aspect in which it has been presented to the public is not the one which would render it available to the masses of the people, —to that portion of the community which has the greatest need of its benefits.

Great and repeated efforts have been made in England to establish what have been usually called Friendly Societies,—the chief aim of these societies being to provide some fund for the destitution of old age or the wants of a family bereft of its head. Various causes have led to the almost universal failure of these societies. Two may be mentioned. The scales of premiums of these societies, —partly through ignorance and partly through competition for business,—have been too small and have borne unequally on the different ages of the participating members. Again, the nature of the business has been such that a sufficient fund could not be accumulated in the beginning of the business to meet the fluctuations of the demand upon it,—and thus these societies have become bankrupt before the system could be fairly tried.

The aspect in which life assurance has been placed before the public, and in which the public has availed itself of its benefits, is precisely that which renders it eminently safe in this last particular. The premiums which are annually paid for life policies are nearly twice the amount necessary to cover the risk in the early part of it,—and thus the funds of the company during its early years must be constantly accumulating, until they are sufficient to meet the fluctuations of mortality. Thus, a life insurance company properly conducted must necessarily be a safe investment of money,—nor can it possibly need a capital stock to commence the business—and drain its profits.

It would seem, then, that if the two systems could be in some way combined together so as to be rendered available to the two classes of society which have usually availed themselves of their benefits;— the risks might not only be safely undertaken, but a great blessing would be imparted to the community.

The parties who can safely undertake a contract with a life insurance company, as these contracts are usually made,—that is, who can safely engage to pay an annual amount of premium to secure a benefit at death,—are plainly two. First, the creditor, who has an interest in the life of his debtor to the amount of premium he pays for his assurance. Second, the man of certain income, who, so long as his life continues, can engage to appropriate a specified amount of his annual income to secure a benefit at death.

Now, this second class, evidently embracing by far the largest proportion of those who insure their lives, must comprehend a small proportion of the whole community. It cannot embrace the me-

chanic,—the operative,—the industrial classes of the community, whose small incomes are dependent on health,—on the fluctuations of trade,—on the caprices of capital. That it does not in fact embrace all who *do* insure their lives is plain from the fact that many who do so find themselves unable to continue the payment of their premiums, and thus forfeit all advantages from those already paid; so much is this the case that one of the sources of gain confidently anticipated by insurance companies is the premiums from forfeited policies.

And yet life assurance is capable of being made available to all classes, and without any of these contingencies. If instead of making the benefit dependent on a periodical payment to be continued through life, or through any specific period, the benefit were to be purchased at once, in proportion to the sum paid, it could not be forfeited on any future contingency.

Table VI exhibits a scale of benefits to meet these views. A mechanic of the age of 30 takes a policy,—not for any specific sum, but for the several amounts proportioned to the sums paid by him to the company and to the ages at which they are paid; thus the amounts paid, the date when paid, and the amounts these several payments are individually to secure him at his death are entered in appropriate columns in the policy itself,—and might stand thus:

Date of Payment to the Company.	Amount Paid.	Age.	Amount Insured.
April 1, 1850	$ 5	30	$11.95
May 30, 1850	1	30	2.39
Aug. 1, 1850	10	30	23.90
Dec. 1, 1850	4	31	9.40
Feb. 1, 1851	5	31	11.75
etc.	ect.	etc.	etc.

Thus by the payment of $25 in the course of the year he has secured to his family $59.39 at his death; and when it is recollected that these payments are not obligatory on him,—that they are paid when most convenient to him, and only when convenient to him,—it is plain that it would form one of the best species of savings banks the world has ever seen. These policies would, of course, participate in the profits of the company at rates such as would be paid by premium for the same amount of insurance at the age in which it was effected,—and might be considered as a new insurance, and entered as a payment in the appropriate column.

I cannot refrain from mentioning one particular class of insurers to whom this benefit will be regarded as an invaluable boon. Clergymen, whose small income is dependent on their lives,—and in a large proportion of cases too small to secure by an annual premium an adequate provision for their families, might avail themselves of it thus:

The congregation of such a clergyman would, in most cases, gladly aid him for the benefit of his family,—but the chief obstacle

to their effecting an assurance in his favor in the premium form is that they are reluctant to engage themselves to a continuous series of future payments when the contingencies that may happen are taken into account. For instance, he might leave them in a few years, and their interest in him would cease,—at any rate, in so much that it would become their duty to transfer it to another. But if they present to him an accumulative policy of the kind mentioned, the benefits they buy for him could be increased at pleasure, and terminate when they choose,—to be continued, perhaps, by another congregation for the amounts and at times most convenient to them. This would be a Clergyman's Benefit,—and would interest all the ladies of the community. "Ladies Fair" would become large patrons of life insurance companies.

It remains to show how this benefit can be used as a provision for sickness or old age,—how the life insurance company can be made the best and safest Friendly Society. This can be done in two ways. First, the party could sell to the company any proportion of his policy, at any time, on a sudden emergency such as sickness. The rates at which the company should buy are exhibited in Table VII. These contra transactions should also be entered on the policy, and might stand thus:

Amount Insured.	Date of Payment by the Company.	Age.	Amount Paid by the Company.
$ 10	May 1, 1854	34	$ 3.03
50	June 1, 1863	43	18.36
100	April 1, 1880	60	55.69

It is plain that the difference between the two footings of the columns marked "Amount Insured" will be the liability of the company on the policy at the death of the party. Second, the party might use the present worth of the whole amount he has insured, or any part of it, to purchase an annuity for his old age. Thus, suppose when the party is 65 years of age he has an assurance of $1,000 purchased by one or several payments. The company would pay him down in cash for this $611.22; but they would grant him an annuity for his life of $73.58. There are few working mechanics, it is presumed, in this country, who could not between the ages of 25 and 50 purchase in this way an insurance for $3,000, and this would buy them an annuity when 60 years of age, of nearly $300 per annum.

It should be noticed that in calculating the rates for these different benefits, they are so adjusted as to make the profits of the company by them in the same proportion as if they were purchased by annual premiums. This has been done on the supposition that the parties, so long as they remain in the company, participate in all its profits.

(Signed) C. Gill.

Newark, Dec. 18th, 1849.

To the New York Public Library
from the author
(per S.A. Joffe).

Charles Gill; the First Actuary in America.

(Fourth and Final Paper.)

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Emory McClintock.

Reprinted from Transactions of the Actuarial Society of America, Vol. XV, Part II, No. 52. October 1[illegible]d 16, 1914.

CHARLES GILL; THE FIRST ACTUARY IN AMERICA.

Charles Gill; the First Actuary in America.

(Fourth and Final Paper.)

BY

EMORY McCLINTOCK.

The early portions of the present account of Charles Gill are expressly stated to have been incomplete and composed of fragments pieced together. The reader has known of these defects, but will be better satisfied when he learns that the shortcomings of the previous papers are now made good by the contents of a memorandum book written throughout by Gill himself, giving in skeleton form the facts of nearly his whole life. These invaluable bits of information came to me from the same source as the picture of Gill, which was reproduced in the third paper, namely, from Mr. Strong, the editor of the *Transactions;* the original memorandum book being loaned by W. C. Gill. The copy Mr. Strong has sent reached me at the time of the May meeting, and includes photographic copies of each page to enable any doubtful parts of the original to be enlarged by a magnifying glass. I find it convenient to prefix the capital letter G, in parenthesis, to each quotation from Gill's manuscript, engaging to omit nothing. Along with each part of the Gill manuscript, I shall give, if necessary, some indication of the corresponding part of my own preceding papers, to enable the reader to see for himself how near my guess as to the fact was to the truth.

The first extract from the first paper is the following quotation from Dr. Muhlenberg's account: "At the age of thirteen he went to sea, and made a voyage to the West Indies; and, in scarcely three years afterwards, we find him aboard of a small vessel, where the captain and officers had been carried off by yellow fever, taking the command; and from his knowledge of mathematics, as applied to navigation, he brings the ship safely to port." Of course much of this came from Gill himself. It can be contrasted with his first account, as follows:

(G) 1818 Friday Dec. 4th. Came on board the Brig Promise, Capt. Brown.

(G)	Dec.	24th.	Sailed from London.
(G)		27th.	Sailed from Gravesend.
(G)		30th.	Sailed from the Downs.
(G)	1819 Jan.	11th.	Passed Lisbon.
(G)		19th.	Arrived at Cadiz.
(G)	Apr.	1st.	Sailed from Cadiz.
(G)		14th	Saw and passed the peak of Tenerife.
(G)	May	30th.	Arrived at Verra Cruz and let go the small bower, time the men were aloft furling the sails it came on to blow a heavy gale of wind from the North came, let go the best bower, the vessel still driving until she got aground struck top gallant masts and yards and made all as snug as possible. Cut the small bower cable having parted from the best, the gale lasted about six hours.
(G)	June	1st.	Hove off the ground and moored in five fathoms of water.
(G)		13th	At 12 P M Capt. Brown took ill.
(G)		14th	At 8 A M went ashore ill.
(G)		17th	At 3 A M died of the black vomit, and at 5 P M ship's company ashore at his funeral.
(G)	July	4th	Sailed from Verra Cruz.
(G)		30th	Arrived at Havanna.
(G)	Aug	17th	John Ransom took ill.
(G)		19th	Sailed from the Havanna.
(G)		20th	John Ransom died of the black vomit.
(G)	Oct.	10th	Arrived at Cadiz.
(G)		29th	Wrote to Staxton.
(G)	1820 Jan	10th	Received a letter from Staxton.
(G)		12th	Wrote to Ditto.
(G)	Apr.	22nd	Sailed from Cadiz.
(G)	June	14th	Arrived at the Havanna.
(G)	July	30th	Sailed from Havana.
(G)	Sept	7th	Arrived at Cadiz.
(G)		10th	Wrote to Staxton.
(G)	Dec	26th	Sailed from Cadiz.
(G)	1821 Jan	15th	Arrived at London.

(G)		21st	Wrote to Staxton.
(G)	Feb	17th	Left the Brig Promise.
(G)		19th	Went on board the sloop Juno to work my passage to Hull.
(G)		21st	Sailed from London, beat up the coast and on the
(G)		26th	In the morning had sight of Leostaff with a good stiff breeze the sloop happening to miss stays the calf-hearted skipper up helm and bore away for Harwich, run in and dropped anchor, laid until morning when we had S E wind.
(G)		27th	Beat out of Harwich.
(G)		28th	In the evening with a heavy gale of wind came bouncing into the Humber.
(G)	Mar	1st	Got into a pilot boat and got into Hull about 3 P M, found Father waiting for me. Got a new suit of clothes, and on the
(G)		5th	Left Hull, and on the
(G)		6th	Got to Staxton.
(G)		7th	Rested myself.
(G)		8th	Went to Mr. Foster's, Newton, and engaged to teach his children for 5 £ 6 months.

There is, in the book, a space where is found a legible signature

(G) Staxton C. Gill.

This may be intended for his signature, but it looks as if the boy had chosen it as part of his name, beginning with his birthplace as a first name; perhaps he may have been known among his mates as "Staxton Gill." As a signature, it comes at the end of the account of his voyage, and it is possible that he signed his name in the same way on the ship's articles.

(G)	Apr	3rd	Commenced teaching. Sent letter to Uncle John.
(G)		16th	Received a letter from Ditto.
(G)		21st	Went to Staxton on a visit.
(G)		23rd	Came back to Newton.
(G)		24th	Wrote to Uncle John Gill.

We have thus for the first time the particulars of Gill's beginning work as a teacher, "engaging to teach Mr. Foster's children for six months." There were several villages named Newton in the North Riding of Yorkshire, and which was the house of "Mr. Foster" cannot now be ascertained.

I have said that "the finding of employment for the first time, was a thing of difficulty to this boy of sixteen," and have said much about "Mr. X," and particularly that this important though nameless personage "was the very man to become his helper in this his time of real need. I assume that his help was forthcoming, and that Gill's getting the place at Ganton was due to his influence." The next entry in Gill's Diary is

(G) Oct. 11th Commenced at Ganton.

Putting it all together, we find that he wrote to his uncle after beginning as a teacher and a fortnight later got a letter in reply, then came "to Staxton on a visit," returning in two days, on the next day writing a final letter to his uncle. These three weeks may have been busier than the diary tells. It is not unreasonable to think that the business related to his future employment at Ganton, close to Staxton, at or near which place his uncle presumably lived, that he heard from uncle that there was an opening at Ganton, that he soon "went to Staxton on a visit," and on returning "wrote to Uncle John Gill," giving an affirmative reply to the offer by uncle of the place at Ganton. After teaching for the six months as he engaged to do, he left Mr. Foster's for Staxton, and after staying there for ten days "commenced at Ganton." The "help of Mr. X" was unnecessary (unless his name was Gill, if miracles are long past). Uncle's help was probably given in other ways. It is more likely, that, as I said before, "the Ladies' Diary for 1822 must have been beyond his means as a subscriber. There was probably no subscriber to it, except Mr. X, nearer than Scarborough, if indeed any more were to be found there." This was then a rather costly part of a teacher's outfit, and while uncle might perhaps have paid for it, it is more likely that "Mr. X must have given the use of his two copies for two years, unless Gill had some mathematical friend at Scarborough to lend them to him." It will be remembered that Mr. X was no myth, but that he really lived at Seamer, within two miles of Staxton and not much farther from Ganton.

The next entry in the diary, after three years at Ganton, is

(G)	1824 Sept.	13th	Went to York to be instructed in the Madras System of Education.
(G)	Oct.	15th	Declared competent by the Secretary, for teaching.
(G)		20th	Left York.

There was an equally important matter to attend to before leaving York, namely, his suit to Miss Eliza Stokes, at No. 25 Bootham Row, York. We are to see the result after more than a year.

(G)	1825 May	21st	Broke up at Ganton.
(G)		23rd	Left Ganton.
(G)		25th	Arrived at Thorp Arch and assisted in preparing Mr. Nixon's School for the vacation.
(G)	June	17th	Mr. Nixon's School broke up for the vacation.

He appears to have arranged before leaving Ganton for a month's employment at Thorp Arch in the West Riding, in the valley of the Wharfe, a river famed for its beauty.

(G)	June	21st	Left Thorp Arch and visited Knaresbro', Leeds, York, Hull etc and on 8th July arrived at Staxton—"home."
(G)	July	13th	Went on a visit to Marton and Helmsley, and returned on the 23rd.

Helmsley is stated to be in the North Riding, some twenty miles from York. There seems to be no reason for his visit unless his fiancee chanced to be on a visit to the same place.

(G)	1825 Aug	1st	Left home for Hull and treated with Messrs. Appleton etc. on the Hessle School.
(G)		8th	Opened the "Academy at Hessle"—Mem. only 14 pupils the first week.
(G)	Nov	21st	Removed to the parish school.
(G)	1826 July	6th	Married Miss Eliza Stokes, Bootham Row (No 25) York,—at the Parish Church of St. Olaves, Marygate, York, and on 16th left York to resume my duties.

Eliza's second name, called Elechia in the Seamer register, is probably Alicia, spelled Elesha by her son W. C. Gill.

(G)		Nov	4th	Mrs. G. came to Hessle after being a month visiting my friends at Staxton etc.
(G)	1827	June	24th	At about 10 min. or 1/4 hr. after 4 o'clock A. M. was born Charles Gill, son of C. & E. Gill.
(G)		Aug	19th	At about 10 m. or 1/4 past 6 O'clock A M died Charles Gill, aged 8 weeks 2 hrs., and buried August 21st.

The Hessle parish register contains the record of two baptisms accordingly shortly after the above dates.

(G)	1828	Jan	31st	Rec'd possession of the house belonging to the parish school.
(G)		Apr	1st	Was examined and elected as master of the Seamer school.

The Seamer examination may have been conducted or taken part in by Mr. X.

(G)		Apr	7th	Left Hessle.
(G)			16th	Commenced in the Seamer school.
(G)		Oct	3rd	Born Eliza Ann Gill 1/2 past 1 O'clock P M.
(G)	1830	Sept	15th	Born Charlotte Mary Gill at 1/2 past 3 o'clock P M.
(G)		Oct.	21st	Left Seamer at 5 P M.
(G)			22nd	Past through York at 8 A M.
			"	Arrived in Liverpool at 11 1/2 P M.
(G)		Nov	2nd	Left Liverpool in the ship Florida, Capt Tyler.

The reader knows that I took for granted that Gill was accompanied by his family.

(G)	1831	Jan	3rd	Arrived in New York at 1 1/2 hours A M after a very severe passage (See the Journal).

Gill's statement in application for life policy concerning the date of his coming to New York was certainly wrong by a year.

(G)	1831	Jan	11th	Moved to Saw Pitt, County of West Chester, State of New York, as teacher of the Rye Academy.
(G)	1832	Dec	6th	Left Sawpitt.
(G)	1833	Jan	1st	Commenced as mathematical teacher in Mr. Hawkesworth's Academy, Richmond, Virginia.
(G)		Oct	7th	Appointed Professor of Mathematics and Natural Philosophy in the Flushing Institute—Wm Augustus Muhlenberg principal.
(G)		Nov.	14th	Commenced the duties of that situation.
(G)		Dec.	16th	Went to board at the Institute.
(G)	1834	Nov	25th	Charlotte Mary Gill died.
(G)	1838	Mar	10th	Advised Dr. Muhlenberg that I could not accept the trust of St. Paul's College which he had devised to me by will (jointly with others). Moved thereto —1st—by being married while it is advisable that trustees be single—2nd—by a consciousness of a concealment from Dr. M. so that he was trusting me without *perfectly* knowing me.
(G)	1840	Apr	10th	Advised Dr M. of my intention to bring my family to this continent.
(G)		Aug	20th	Eliza and E Ann arrived at New York.
(G)	1841	Sept	11th	William Charles Gill born 8 hr. 50 min. P M.
(G)		Nov	5th	Removed to New House, College Point.
(G)	1842	July	5th	Received notice from Dr. M. that he should disband college classes next session and should therefore have no further occasion for my services.
(G)	1843	Mar	28th	At 5 1/2 A M Mary Gill born.
(G)	1848	June	24th	Commenced as discount clerk in the Atlantic Bank, Brooklyn. Salary $600 per annum.
(G)		Aug	6th	Removed to Brooklyn.
(G)	1849	April		Appointed "Mathematician of the Co"—by the Mutual Benefit Life Insurance Co, Newark, N. J. Salary $1000.

(G)		Apr	30th	Removed to Newark.
(G)		Sept	14th	Salary raised to $1500.
(G)		October		Appointed Actuary of the Mutual Life Insurance Co. of New York. Salary $2000.
(G)	1850	Feb	1st	Commenced duties of Actuary of Mutual Life Insurance Co.
(G)		April		Family moved to New York.

THE YEAR 1833 IS PASSED IN VIRGINIA.

The diary states, contrary to all my previous ideas, that the year 1833 was passed in Richmond, Va., instead of in New York or its neighborhood. A letter has been unearthed, written by Mr. William Hawkesworth in November, 1832, coming along with the diary, and photographed likewise by Mr. Strong, which carries its own explanation, and is given to my readers accordingly without comment. It is addressed to "Mr. C. Gill, Sawpits, New York."

"RUMFORD ACADEMY,
King Wm. Co., Va.
Nov. 27th., 1832.—

"*Sir,*

"I have just received your favor of the 20th. inst., accompanied by a letter from my worthy friend, Mr. Ryan of New York, and reply without delay. With regard to the duties to be discharged by my associate, I have to observe that they consist in instructing the pupils of my school in all the branches of mathematicks, including surveying practically as well as theoretically, besides, all the common branches of an English education including English Grammar, reading, spelling, writing and geography, with the use of maps and globes—this comprises everything expected from a Teacher of English and Mathematicks in this part of the Country —from the first day of January next, my residence and Academy will be in the City of Richmond, as I have sold this Institution in consequence of preferring a Town to a Country life—the number of hours during which your services would be required, would be about 6, from 9 o'clock in the forenoon till 3 o'clock in the afternoon, after which time you will be perfectly your own master till next day—you say that you cannot accept less than six hundred dollars per annum for your services, this is more by $100 than I expected to give, at least for the first year, but in consequence of

the very high recommendation of my friend, Mr. Ryan, I depart from my determination and will allow you six hundred dollars per year, payable half-yearly, for the services rendered by you, which I have already specified—it is only necessary for me to observe to you in addition to what I have said that you will have two months of the year vacation, August and September—good and respectable board can be had in Richmond upon reasonable terms, and I assure you that it is a healthy city, and the climate particularly agreeable during the Winter Season—I shall require your services from the first day of January 1833, you can get a very comfortable passage in the line of packets, from the City of New York to Richmond for $10—I believe that I have given you every necessary information, and as I have acceded to your terms, presume that I may consider you engaged—favor me with a line as speedily as possible, and do not pay postage, as my privilege of office as post-master exempts both me and my correspondents from the expense of postage—I remain, Sir, with sentiments of respect,

"Yr. obedt. servt.

"WILLIAM HAWKESWORTH."

THE MUTUAL LIFE FEELS THE NEED OF ACTUARIAL ASSISTANCE.

Having recapitulated the facts ascertained thus far concerning Gill's life, up to the last entry in his diary, that of February 1st, 1850, telling of his entry upon the duties of Actuary of the Mutual Life Insurance Company, I come in the course of these desultory pages to the close of the third paper, which happens to coincide with the date just mentioned.

Some months before that date, that company had begun to feel the need of actuarial assistance. The first record of it is found in the board minutes of the month of September, 1849, nearly six months after the Mutual Benefit led the way in the appointment of a "Mathematician," or actuary, in the person of Mr. Gill. The Mutual had, the year before, declared its first dividend, and had employed its secretary to complete the details according to simple principles considered equitable, fortified by a calculation of reserve liability according to the Carlisle Table, assuming interest at four per cent. On the whole, I think it likely that this circumstance, coupled with the appointment of a man as well known as Mr. Gill, should have led the trustees of the Mutual Life to have considered a proposition, which was thought of obviously for some weeks pre-

viously, and on the sixth day of September, 1849, a special meeting was called for the consideration of the "following proposition, viz:

"To create a Vice-presidency.

"To create a standing committee on election of Trustees, and

"To appoint an Actuary."

"In conformity therewith, Mr. Pearson offered a resolution creating a Vice-President, and defining his duties. After a prolonged discussion, Mr. Swift moved the substitution of Actuary for Vice-president, which was accepted by Mr. Pearson and the resolution then passed unanimously, viz.,

"Resolved, that in addition to the present officers of the Company, there shall be an Actuary, to be elected by ballot, soon after the passage of this resolution, at a meeting specially called for this purpose, and annually thereafter, on the Wednesday following the first Monday in June.

"On motion of Mr. Winston, a committee was appointed to propose the names of candidates for the office of Actuary, define the duties he would be expected to perform, and suggest a suitable salary, and on said committee being ready to report, the President was requested to call a meeting of the board.

"Messrs. Winston, Moore, Swift, Grinnell and Blunt were appointed said committee."

October 31st, 1849, the report of the committee on an Actuary was read and accepted. The resolutions appended after discussion were on motion adopted as follows:

"The committee to whom was referred the duty of nominating a suitable person to fill the office of Actuary to this Company, to define his duties and to recommend a suitable salary, respectfully report,

"That they have received and examined testimonials of qualification in favor of several applicants of very respectable character both as to mathematical attainments and general fitness for the duties of the office.

"Professor Charles Gill, Mr. Richard K. Bull, and Mr. Charles E. Anderson furnished the Committee (in addition to undoubted testimony as to excellence of character and business habits) letters from individuals deemed by your Committee the highest authority in mathematical science in this country, testifying to the eminent attainments of these gentlemen, either of whom we believe to be competent to the duty of Actuary in this Company.

"Professor Gill having been longer before the public as an author of high standing in mathematical science, is better known both in this country and in England, and as he unites the other qualifications necessary for the discharge of the office, the Committee unanimously recommend his appointment.

"The Committee would specify the following as the principal duties of the Actuary, viz: such as ordinarily appertain to the office; to make calculations and tables for the present and future use of the Company; to audit the receipts and payments of money; to collect such useful data, books, documents, tables and official statements for the use of the Company as relate to the business of life insurance; to confer from time to time and as often as is necessary with the officers and committees of the Board on matters relating to his department and to report quarterly to the Trustees at their stated meeting.

"In conclusion, your Committee recommend the passage of the following resolutions:

"Resolved, that the Board proceed to ballot for an Actuary to this Company.

"Resolved, that the salary be fixed at two thousand dollars per annum."

This report having been signed by each of the five members of the committee, and Messrs. Tuckerman and Wadsworth having been appointed tellers, the Board proceeded to ballot for an Actuary. The vote having been counted, the tellers reported that Mr. Charles Gill had received a majority vote, and was duly elected.

This is the official record of the 31st of October, 1849. There are indications of preliminary negotiations being held between "The Committee on an Actuary" and Mr. Gill. On November 20th, Gill's resignation was presented to the Directors of the Mutual Benefit and duly accepted. The previous month a letter was sent to Mr. Gill by Mr. John H. Swift, one of the leading members of the Committee, as follows:

"New York, 19 Oct. 1849.

"*My dear Sir,*

"I am happy to inform you that our Committee had a meeting to-day and agreed to recommend you to the Board of Trustees to fill the office of Actuary. The subject of salary was also referred to the

Committee and they have agreed to recommend $2000 per annum as the salary.

"In haste, yours truly,

"JOHN H. SWIFT.

"Mr. C. Gill,
"Newark, N. J."

IN THE MUTUAL LIFE: IN THE YEAR 1850.

On the eighth of May, 1850, two communications were read from the actuary to the board of trustees, which were ordered on file, and were called respectively *A* and *B*. We are unfortunately left to lament the loss of these communications, because there have not been preserved any documents which had been ordered filed with the minutes, a destructive order being given some years ago. Copious extracts from the minutes themselves have been supplied to me by Mr. Joffe, to whom I have been so much indebted, and the extracts so made sometimes refer to previous communications, and so enable one to gain an idea of the documents formerly "on file."

The requirement that the actuary be elected annually by ballot was changed by vote of November 4, 1849, so that he was made permanent, subject to the pleasure of the board.

The "Insurance Committee" on May 8, 1850 were instructed with the addition of "Messrs. Fabre, Schuyler and Pell," to examine and report on *A* and *B*, already referred to, and also to consider the expediency of reducing the tariff of premiums then charged by the company, and so were empowered to employ counsel if they thought necessary. The "Insurance Committee," as a matter of form, reported progress after their quarterly sessions, and the board minutes contain repeated reference to the subject.

The committee reported concerning it, that the actuary urges that the present mode of making dividends as required by the charter is inequitable to the policy-holders, because one paying premiums for 10 years only gets the same rate of dividend as one who has to pay, if he lives, through 20 or 30 years; the actuary proposing to give each policy-holder "such sum payable at death as the dividend would now purchase," thus equalizing the profits. While the committee thought this plan equitable, they doubted whether it would conform to the provisions of the charter, and referred this problem to the legal members of the board. Those gentlemen proposed the plan of "*reducing the rate of premium* to policy-holders

by a sum equivalent to a *given percentage of the profits standing to their credit respectively.*" This must be intelligible, because Gill made up tables accordingly, showing how this plan worked out in practice, in comparison with his own plan already stated. This report of Gill's was duly filed, as it is so stated in the minutes. The plan of the legal gentlemen must have been better understood than they worded it. Perhaps it was copied wrongly on the minutes. As it was meant by the authors, and understood by Gill, in whatever manner it was really worded, it was accepted by the committee. The minutes say that they "agreed to recommend it," but it got no further, a fate which it certainly deserved.

The most important production of that year from Gill was a report on the company's mortality for the first eight years (1843–1851) which will be given herewith as Appendix F. This was presented to the board in June 1851 and, as usual, filed. However, it escaped the usual fate, because it was the next day ordered that 1,000 copies should be printed, of which at least one has been preserved. It was soon reprinted by the *Assurance Magazine*.

YEAR 1851: GILL'S JOURNEY TO ENGLAND.

On May 14, 1851, Gill was instructed by the board of trustees to make a trip to England, at the company's expense, the cost not to exceed a thousand dollars. The committee having to consider Communication *B*, on file for more than a year, the actuary presented two propositions concerning it, namely,

"First, the issuing a species of policy to be denominated 'An Accumulative Policy,' as 'fully described in said paper,' and

"Secondly, to authorize a recalculation of the tables of rates used by the Company, so as to make them more consistent with the present state of the Science of Life Insurance."

In the judgment of the committee, "Inasmuch as the Accumulative Policies cannot be expected to succeed at the present rate of single premiums authorized by the Board, the recalculation must precede their issue, and in order that he may be more fully provided with the data required, the Committee recommend that the Actuary be authorized to visit Great Britain, to confer with the appropriate officers of Life Insurance Companies in that country, and to procure such works on the subject as he may deem necessary."

The next entry which relates to the actuary in the minutes of

the board of trustees is, that on August 13 "the President reports that the Actuary returned from his European excursion in the steamer 'Pacific' July 31st, and will present a report at this meeting, his whole expenses, including $63.10 for books, having amounted to $483."

The report was approved, and such clerical help as was needed by the actuary for the calculation of the tables was authorized, and the president and actuary were authorized to purchase such books as were found of importance from time to time, not to exceed the unexpended balance of the thousand dollars appropriated May 14.

So great was the effect produced upon the board by the actuary's economical trip to Europe, costing $420 of $1,000 given him for the purpose, besides books, that at the next meeting the board fixed his salary at $2,500 from August 1, 1851.

This was the great year in which people were prosperous all over the world. The rush to Europe was beyond precedent. The fame of the "Crystal Palace" had gone abroad, and Gill's friends must have congratulated him on his lucky chance to visit England and see the "World's Fair." He must have had the opportunity in view from the first, and he was the one to make the most of it.

People thought the millenium had arrived. Wars were a mere subject for historians of old events. There had been no war in Europe since Waterloo, and none in America since the battle of New Orleans, except one "national crime," as many called the war with Mexico, though there were some who still remembered the Alamo. The period preceding 1851 in Europe was singularly fruitful in producing ideas of public betterment, now called "socialistic," such as the numerous schemes, now mostly forgotten, for communistic societies. It was a time for revolutionary movements in all European countries. The time was fully ripe for such an idea, revolutionary as it seemed to some, as a great international exhibition. It seemed as if all things of the kind I have mentioned came to a head in the Crystal Palace in London, under the leadership of Prince Albert, the husband of the Queen, and the exhibition was hailed by many enthusiastic souls as the greatest work in history. Gill came to London while the World's Fair was going on, and the thing must have moved him greatly—though he was a man of too much sense to be carried away by the anti-social theories which he must have met on every side.

In December, 1851, Gill received a formal letter from Samuel

Brown and Robert Tucker,* Honorary Secretaries of the Institute of Actuaries, saying that he had, on November 20, been unanimously elected by the Council a corresponding member. He had probably met previously more than one member of the Council.

Gill appears to have been greatly pleased with his proposed plan for issuing policies of a special form, the "Accumulative Policy." This was apparently the same plan which he had proposed to the Mutual Benefit, which has been given in Appendix E at the end of the third paper.

It never rains but it pours. The year 1851 seems to have been most prolific for Gill's genius. In June he worked out a paper on "The Determination of Surplus" which appeared in the Journal of the Institute of Actuaries afterward. This paper is short, and is produced herewith as Appendix G. For some mysterious reason, akin to that which is sometimes called the "law of compensation" in the newspapers, the very next year, 1852, passed without a single reference to Gill in the board of trustees, until the very last entry, when a special meeting was called just at the close, on the 22d day of December.

The special meeting of the board had for its object the reception of a report of the "insurance committee," which was obviously timed so as to enable the company to print the new table of rates prepared by the actuary and contemplated by the committee for some months. A motion to that effect was passed, and also one to discontinue the issue of policies in California.

IN THE MUTUAL LIFE: A. D. 1853.

In this year occurs the only irregularity which I have noticed in the minutes of the board of trustees of the Mutual Life Insurance Company, which have been kept with the utmost regularity for more than seventy years past.

The matter concerned is the "Second Mortuary Report," ten years after the beginning of business in 1843. A copy of this report, signed by C. Gill, as actuary, and addressel to the board of trustees, dated May 9th, was doubtless presented to the board, but

* As a coincidence, I may mention that Mr. Tucker, who was always prominent in the Institute, was the only member I recollect having met before I was admitted forty years ago, after I had shown a certain proficiency by one or two communications; I have always thought that I owed it to his good offices.

nothing concerning it appears in the minutes of that day or any subsequent day. The minutes of March 7 merely refer complimentarily to the actuary's "statement" possibly mentioned formally a little later as follows: "The president read the following statement of the affairs of the company, with the accompanying balance sheet and *communication from the actuary,* which were ordered on record as usual." The words here italicized may refer to the Second Mortuary Report, but it does not seem likely. All reference to it appeared to have been forgotten, yet it must have been ordered printed, like the 1851 report, though the order for printing it is not stated in the minutes. Fortunately, a copy of it has been preserved, and is now given as Appendix H.

The following is the statement and balance sheet, as reported by the Insurance Committee on March 5:

"The Insurance Committee further report: That they have carefully examined the Statement of the business of the Company, and its present condition as prepared by the Actuary; that they have had the principles upon which his calculations are based reviewed by Professors *Loomis* of the *University* of *New York* and *Webster* of the *Free Academy,* whose certificate endorses the accompanying exhibit."

Loomis was shortly afterwards at Yale, where I knew him then and later as a teacher of high standing.

"It will be perceived on an examination of the Actuary's statement, that an ample fund is reserved to cover the ordinary outstanding risks, as well as an additional sum to protect the Company against the hazards of Climate, and other extra exposures.

"And the Committee entertaining the opinion that the calculations and recommendation of the Actuary may be fully relied upon, offer for the adoption of the Board of Trustees the following Resolution, viz:

"Resolved, that a dividend of *thirty-three and one-third per cent* be declared on the amount of premiums at table rates, received on Life Policies since *February 1st 1848,* as covered the risks to *February 1st 1853;* also a similar dividend on the amount of premiums on Term Policies issued previous to *February 1st 1851* and that covered those risks to *February 1st 1853;* also a dividend of *sixteen and two-thirds per cent* on the premiums on Term Policies issued since *February 1st 1851* on so much as covered those risks to *February 1st 1853.*

"Also Resolved that the aforesaid dividends be made available in the manner set forth in the Ninth Annual Report and as per exemplification herewith.

WILLM. MOORE
NATHL. HAYDEN
WILLIAM BETTS
I. GREEN PEARSON."

"New York Mar. 5th 1853.

"The President read the following Statement of the affairs of the Company with the accompanying Balance Sheet, and communication from the Actuary, which were ordered on record as usual.

"TO THE BOARD OF TRUSTEES OF THE MUTUAL LIFE INSURANCE COMPANY OF NEW YORK,

"*Gentlemen,*

"In presenting to you at the termination of its second quinquennial period, the balance sheet (A) of the Company, the result, on my part, of great anxiety, assiduity and labor, permit me to congratulate you on the prosperous state of affairs which it exhibits; a state, to say the least of it, which challenges comparison with that of any Life Assurance Society in the World, at the same date from its organization.

"The beneficent working of the Company under your guidance during the ten years of its operations, may be exhibited in one view, thus:

Total receipts during the 10 years		$3,379,896.22
Total claims and additions	$999,026.91	
P. for Surr. Policies	60,783.41	
Total expenses of business	299,736.60	1,359,546.92
Net Assets		$2,020,349.30

Recommended to be thus appropriated:

Total reserve for Pols. & Anns	$1,252,288.65	
1st Divd. present value	184,746.04	
2nd Divid. present value	576,356.45	
Undivided surplus	5,384.50	
Due 3rd Dividend	1,573.66	$2,020,349.30

"If it be asked how the Company has thus been able virtually to return to its individual members more than one-fifth of the gross amount of premiums and interest they have received, I beg leave to refer for answer, to the accompanying statement (B).

"Very respectfully, C. GILL,
Actuary."

Second Dividend Statement.

"33⅓ per cent. on $1,551,555.16, being so much of the premiums, at the table rates, received on existing Life Policies since February 1, 1848, as covers the risks to February 1, 1853**	$517,185.05
"33⅓ per cent. on $169,059.17 being so much of the premiums at the table rates, received on existing Term Policies, since February 1, 1848, and issued prior to February 1, 1851, as covers the risks to February 1, 1853	$ 56,353.06
"16⅔ per cent. on $16,930.06 being so much of the premiums, at the table rates, received on existing Term Policies issued since February 1, 1851, as is necessary to cover the risks to February 1, 1853	$2,818.34
"Undivided surplus	$5,384.50
	$581,740.95

"The undersigned have examined the contents of the foregoing balance sheet, and have listened to the Actuary's statement of the principles on which it is based, and are satisfied that those principles are perfectly safe and afford the highest security to the parties insured.

"HORACE WEBSTER
"ELIAS LOOMIS } *Auditors.*

"New York, Mar. 3, 1853.

** This will give a corresponding addition to the Policies of from 43 to 100 per cent. or a diminution of the future premiums of from $1\frac{86}{100}$ to $5\frac{72}{100}$ per cent. of the premiums as above."

On March 7, there were ordered extra payments to those concerned in making out the dividends, as follows:

"*Resolved,* that two hundred and fifty dollars be paid to each of the following attachés to the Office for extra services in making up the quinquennial statement preparatory to and arising out of the

dividend, and subsequently, the President having retired, five hundred dollars each to the President and Actuary for past services."

It must have been in September of this year, 1853, or soon after that Gill was engaged in the somewhat invidious task of making a valuation of the renewal commissions of the Johnston agency, at the instance of the board of trustees.

I gave, on page 32 of the third paper, some account of the discord in the board caused by the election of Mr. Winston, which was laid to the account of its most efficient agent, Mr. J. C. Johnston, who was, as we have seen, the subject of a long report, in which his supposed misdeeds for ten years had been recounted, as well as the doings of Mr. Winston's friends in the board. This report, which was not made until July 1856, explained Gill's part in valuing the Johnston commissions, in September, 1853, and I quote from it.

"The Actuary of the Company furnished to the Trustees an elaborate statement of the value of the future commissions, which under the agreement would be due to the Messrs. Johnston & Sons on the policies of insurance theretofore issued by the Company, the amount of which he stated to be $29,055.44. The Board of Examiners after careful examination are satisfied that this computation of the Actuary was made upon sound and equitable principles. On or about the thirtieth of September, 1853 a settlement and compromise were made between the Company and Johnston & Sons, whereby it was agreed that the Company should pay the sum of $30,000 and give to John C. Johnston a paid-up policy of insurance of $5,000 on his life, in payment of the above mentioned value of his future commissions, and in full of his rights and advantage under his agreement in consideration of his surrender of the agreement and a release of all claims under it and his stipulation not to enter as soliciting agent into the service of any other life insurance company.

"This compromise was carried into effect by a committee of the Trustees consisting of Messrs. I. P. Yelverton, R. H. McCurdy, I. Green Pearson, R. Patrick and L. Robinson, and legal releases were executed by the Messrs. Johnston. The Examining Committee, in reviewing the circumstances attending this compromise, do not find in it anything which can authorize them to consider it as inexpedient and, far less, as improper or illegal."

The salary of the actuary was increased as follows, on the ninth of November:

"*Resolved,* that the salary of Charles Gill the Actuary be fixed at $3,000 per annum, to date from the 1st of November, 1853."

YEAR 1854; MORTALITY AND PREMIUMS FOR SOUTHERN RISKS; GILL'S ADJUSTMENT.

The important work of the Insurance Committee for the year 1854 is related in the committee minutes of the special meeting called for August 16 of that year, and provided for the imposition of an extra 5 per cent. on the rate of premium on lives insured in the Gulf States, from Alabama to Texas; which was, I think, continued for years. The record is as follows:

"The President stated the object of the Meeting to be to consider and decide upon the rates of Premium to be charged by this Company in the States of Texas, Louisiana, Mississippi, and Alabama in pursuance of a Resolution passed by the Board at its last Meeting.

"Having become convinced that the rates in these states required revision, he had brought it to the attention of the Trustees and the Board had referred the whole matter to this Committee with power.

"The Actuary then exhibited to the Committee the following Statement and Analysis of the results of the business of this Company:

"'In order to compare the mortality among the Members of this Company residing in the different portions of the United States east of the Rocky Mountains, they are divided into three sections.

"'First, that section lying north of the southern boundary of Virginia and Kentucky where the regular table rates of premium are charged. The experience of the first complete 10 years of the Company's existence shows that out of every 10,000 lives exposed to the chances of mortality for one year in this section 93¾ have died during the year.

"'Second, that section included between the southern boundary of Virginia and Kentucky and the 32nd parallel of North Latitude. It is found that out of every 10,000 lives exposed to the chances of mortality for one year in this section, 117½ have died during the year. This exhibits a degree of mortality 25 3/10 per cent. greater than in the first section, and to equalize the risks between the two classes of Members, those in the second section should pay, at the average age of Insurance, an Annual extra premium of 5 8/100 per cent. of the amount assured.

"'Third, that portion of the United States south of the 32nd parallel of Latitude. The experience of the Company in this section from its commencement to the present time shows that out of every 10,000 lives exposed to the chances of mortality for one year, 186 3/10 have died during the year. Thus the mortality in this section has been 98½ per cent. greater than that in the first section, and to render the risks among the two classes of Members equal to each other, the Assurers in the third section should pay at the average age of Assurance, an Annual extra premium of 2 26/100 per cent. on the amount assured.

"'The disparity in the ratio of the amount of claims from death to the amount at risk in these three sections of the Country has usually been even greater than that of the simple mortality in them. Thus during the first six months of the present fiscal year (from 1st Feby. to 1st August) the Company have had at risk in the first section $18,000,000 while the amount of claims in the section has been $68,500 or $38 out of every $10,000 assured. In the second section the amount at risk is $1,500,000; and the amount of claims during the same time has been $20,000 or $133 out of every $10,000 assured. In the third section the amount at risk is $1,634,000 while the amount of claims during the same time is $42,800 or $262 out of every $10,000 assured.

"'The lives insured by this Company are selected over a vast Continent, in localities where climate, personal habits, social customs and consequent exposure to casualty, disease and death differ as widely as the bounds of the territory embraced. In some States the parties insured live simply and frugally and labor steadily and long, while in other States more bountifully favored in some respects, they toil less, live fast and soon accomplish their aim and end.

"'All Life Statistics taken on a broad scale show this and notwithstanding a particular city or certain locality may occasionally offer an exception, they do not vary the general result!'

"It will be seen by the Actuary's analysis that it embraces the experience of this Company for 10 years ending Feby. 1st 1853, a period previous to the fatal epidemic so destructive to life in the South Western States which raged later in that year.

"Although such an epidemic may possibly again occur in the next 10 years, yet we leave it out of the calculation and base our rate of premiums on the experience of 10 years of fair average health.

"It is not claimed that this experience is long enough to fix conclusively the relative rates of mortality in the classes named, but we have gone far enough to take an observation, and for want of a better guide, we must be directed by our own experience.

"This Company, it is admitted, is strong enough and prosperous enough to continue these extra risks at the previous rates, but our Policy-holders and others in the States named would be the first to acknowledge the impropriety of taxing others for their benefit in the future.

"The Committee therefore decide that the extra rate of premium fixed for the States of Texas, Louisiana, Mississippi and Alabama in addition to our table rates be two per cent. on acclimated, and five per cent. on unacclimated persons.

"It is also recommended that ½ per cent. extra be charged on the class of risks now taken at ¼ per cent. extra."

YEAR 1855; REMAINING EXTRACTS FROM THE MINUTES, INCLUDING THOSE ON GILL'S DEATH.

"*May 9th, 1855.*—The Insurance Committee, finding that the Annuity purchased on the life of A. G. Frazer produced a less amount than it should to make the investment a profitable one to the Company, they requested the Actuary to explain to them how such an investment should have been made.

"Mr. Gill reported in writing, which report with the documents furnished, is herewith submitted for the consideration of the Board:

"TO THE EXAMINING COMMITTEE OF THE BOARD OF TRUSTEES OF THE MUTUAL LIFE INSURANCE COMPANY OF NEW YORK,

"*Gentlemen,* As your attention has been fixed on the fact that the amount invested by this Co. ($5,550) in the Life Interest of A. G. Frazer in a Trust Fund of $10,000 is less than it ought to be in order to render it a prudent investment, I think it right to explain thus formally my own share in this transaction as Actuary of the Company.

"In this capacity I was required to value the life interest of a man of 57 years of age in a property of $10,000 now invested for ten years at 7 per cent. per annum payable ½ yearly. The expectation of life at this age is 16 years and as there was a possibility that after the expiration of the term of the present investment the pro-

ceeds of the Fund might become less, I valued the annual income from the Fund at $600 so as to render the Company safe under any probable circumstances.

"The purchase money $5,550 especially as I exacted a Life Insurance Policy to this amount for two years from another Company, I considered to be a profitable investment until I found that instead of the gross income of this Fund the Company only received the net proceeds after deducting the Taxes on the Fund and the Commission on its proceeds.

"Thus the payments that have been made are:

Dec. 2, 1851	$ 249.27	instead of	$	350
June 19, 1852	336.75	"	"	350
Dec. 14, "	244.55	"	"	350
June 3, 1853	341.25	"	"	350
Nov. 30, "	217.83	"	"	350
May 30, 1854	341.25	"	"	350
Dec. 2, "	239.23	"	"	350
In all	$1,970.13	"	"	$2,450

"Thus producing an average income of $562.90 instead of $700 as was represented to me.

"Yours very respectfully,

"C. GILL,
"*Actuary.*"

"The Committee were pleased with the manner of keeping the Books and particularly with the Actuary's Register and his checks upon the Ticklers and other books."

WHAT WAS THE CAUSE OF GILL'S DEATH?

His death was apparently sudden. Coming without premonition, without warning, his prospects of life had always been good. His expectation must have been better than usual. His expectation of life was notoriously good; even at the present day it seems hard to kill off an actuary, the average longevity of the Society being very good. Of course he had been supplied, by those around him in the office of the largest life company in the country, with all the usual arguments concerning the shortness of life, and the folly of delay in making application for insurance, arguments just as strong sixty years ago as now; he must have been unusually well prepared for the great change when the bolt struck.

The company's present medical director informs me that the records of his department show that the cause of Gill's death, as certified to by his attending physician, was hemorrhage of the bowels, and that he died on the twenty-sixth day of October, 1855. The disease is obscure. Probably it would now be called appendicitis, though there are other causes of perforation of the bowels producing hemorrhage. Modern surgery would almost certainly have saved his life, although such interference with the course of nature would have been thought impious by the general public of 1855.

Some months later, at the next meeting of the board, "the President announced the decease of the late Actuary, Mr. Charles Gill, and gave a brief narrative of the history of the deceased, which upon motion of Mr. Swift, was ordered to be entered upon the minutes as follows:

"It is my painful duty to announce to you officially, the death of Charles Gill, the distinguished Actuary of this Company. He died at his residence in Brooklyn, on the night of the 22nd ulto. of hemorrhage of the bowels, on his birthday, aged 50 years."

In view of the statement as to the exact date of his death, thus given officially, which is furnished differently, as the 26th of October, by the physician who attended him, Dr. Benjamin Ogden, I think it probable that the latter date is correct.

"It is due to the eminent mathematical attainments of Mr. Gill, and to the ability and fidelity with which his arduous labors for the interests of this Company have been discharged, that the Board of Trustees, while they acknowledge his worth and regret his loss, should preserve brief record of his life both before and since he became identified with this Company."

The statements which follow on the minutes have all been given in these pages, almost verbatim, and are therefore omitted.

"The general scope, value and results of his labors for this Company are known to you all, but his ability and fidelity to its interests, as much in all minor details, as in more general arrangements, could only be appreciated by those in daily official connection with him. While no problem was beyond the power of his high mathematical attainments, none was too minute for his patient attention, while he also possessed the rare faculty of rapidly and fully analyzing every question in his department as it was presented.

"His valuable services in establishing a sound basis for our second dividend, while correcting the errors of the first, are known to the Trustees.

"The table of rates for premiums corrected and arranged by him was a work of much labor and care and is of great value to this Company.

"The formulae and tables prepared by him, embracing almost every question which is likely to arise in the Actuary's department, are lasting memorials of his science, industry, and skill, and will greatly lighten the labors of his successor.

"It is a source of gratification, under this loss, that Mr. Gill's position in this institution was appreciated by him as altogether suited to his talents and his tastes, and that his labors and their reward were as satisfactory to him as they have ever been to the Trustees and Officers of this Company. Could he have been spared a few years longer to this institution to aid us in establishing the Science of Life-insurance on the sound basis of practical experience in this new and most important field, his loss would have been less felt, but Infinite Wisdom has removed him from his labors, and left us to discharge our duties unaided by his science and skill.

"On motion of Mr. Swift, the following preamble and resolutions were unanimously adopted:

"'WHEREAS, the Trustees of the Mutual Life Insurance Company of New York now assembled, have listened with painful interest to the official announcement just made by the President of the death of our late Actuary, Mr. Charles Gill, and

"'WHEREAS, Duty and inclination alike impel us to record our high appreciation of him and our sense of the irreparable loss the Company has sustained by his death, therefore, be it

"'*Resolved,* That we look back upon the Appointment of Mr. Gill as Actuary to this Company as one of the most important acts of this Board,

"'*Resolved,* That his extraordinary abilities which placed him in the very front rank of mathematicians, devoted as they were untiringly for five years to the best interests of this Company in correcting errors, in solving difficulties, in establishing a system of checks upon the entire business of the Company, and in working out rules —were eminently instrumental in placing the Company in its present proud position, and cannot fail to have a salutary effect so long as widows and orphans continue to be protected by life insurance.

"'*Resolved,* that as a token of our loss and as an evidence of a debt that money cannot pay,—the President be authorized to pay to Mrs. Gill the salary of her late husband, up to the first of May next.

"'*Resolved,* that the President be requested to hand to Mrs. Gill a copy of this preamble and these resolutions with the assurance of our sincere sympathy with her and family in their sad bereavement.'

"On motion of Mr. Swift, the following resolution was adopted:

"'*Resolved,* that a Committee of three be appointed to examine the mathematical works printed and in manuscript belonging to our late Actuary, and to purchase from Mrs. Gill such works as the Committee may deem it important for this Company to own—provided, however, that the sanction of this Board shall be given to said purchase before it is completed. The following Committee was appointed under this resolution, Messrs. Swift, Stedman and Betts.'"

The Trustees appear to have left nothing undone which could afford substantial aid to the bereaved wife of Mr. Gill. The Committee appointed under the last resolution above mentioned seems to have acted promptly, since I find that on the 5th of December a cash payment of $2,500 for Mr. Gill's library was made to his widow, and that the six months' salary voted was also duly paid. I must however state that there is some doubt left by tradition upon Gill's feelings towards President Winston in his last days in which they were connected. The tradition referred to was told me by Mr. Fackler in a letter sent by him on the 9th of last January. I quote: "There was only one point regarding him [Gill] which has not been stated as far as I know; and that is, that Mr. Gill appears to have been badly treated by Mr. Winston, at least that was the impression which I as a young man got from the few brief statements by Mr. Waterhouse, who was the head book-keeper of the Company at the time I entered the Actuarial Department in 1859. Though I do not recall the exact language used by Mr. Waterhouse, I remember getting the impression that Mr. Winston hurt Mr. Gill's feelings so much by his treatment as to have contributed indirectly to his sickness and death."

The Mr. Waterhouse referred to was the father of the late Archibald N. Waterhouse, who was prominently connected with the company before his death some ten or fifteen years ago. The treatment complained of by Gill must have consisted of language of greater or less harshness of which the president must sometimes have been guilty, if the accounts of those who were familiar with his habits of speech are to be believed. He was thought to be overbearing, jeal-

ous, and irascible, while he could be, on occasion, all that was winning and gracious. I met him only once, when he asked me to lunch with his officers, at which time he showed no trace of the harshness of demeanor I had heard ascribed to him. He was about four years Gill's senior, and he lived about thirty years longer. I suppose, assuming that there was such a tradition, that the fact is that Gill was a subordinate, the highest in rank, and the one to succeed himself in case of a change, and Winston knew that when the appointment of an actuary was arranged by the trustees, six years earlier, as we have seen, there might instead have been appointed a vice-president. There was room for some display of jealousy, and something unpleasant may have been said to Gill, but we can never know anything further than the tradition reported after Gill's death by Mr. Waterhouse. The fact remains that his widow was handsomely treated by the trustees and by their chief and spokesman, Mr. Winston.

At Gill's death, his residence was in Brooklyn. The Brooklyn Directory for 1855 shows that he lived at 170 Sackett Street. The *Commercial Advertiser* for October 27, 1855, contains this notice:

"Died, at Brooklyn, October 26th, Charles Gill, aged 50 years. Burial Services at Church of the Holy Communion, Corner of Sixth Ave. and 20th St., New York, on Monday, the 29th inst. at 10 o'clock A.M. The friends of the family are invited to attend without further notice."

This paragraph appears in the same issue:

"Charles Gill, Esq., Actuary of the Mutual Life Insurance Company, died on Monday Evening, aged 50 years. He was one of the ablest mathematicians of this country, but his labors have been unusually heavy, and he has sunk under them, like the late Walter R. Jones, Esq., dying almost at the writing desk. Mr. Gill was greatly esteemed by a large circle of friends and acquaintances, as well as by the members of the institution to which he has so faithfully devoted his life."

A similar death notice appeared in the *New York Times* of the same date, misspelling the name "Dill." On a least hint from me, and in spite of my warning of the labor involved, Mr. Joffe not only found for me the above notices, but ascertained with probable certainty that there was no other notice published of Gill's death in a large number of daily newspapers examined, and what was still

more disappointing to me, that no periodical printed any account of his life, or other obituary remarks.

The funeral took place from the church of which Dr. Muhlenberg was rector, his best friend to the end. The same clergyman states, in the only obituary we have, the one first mentioned, which was reprinted in the *Assurance Magazine,* that "at the time of his death he had been an active member of the parish of Good Angels, Brooklyn." He added that Gill contributed liberally both of his assistance and his money towards the proposed new church.

SOME OF HIS CHARACTERISTICS.

I have already stated that the strongest element of Gill's character was the depth and constancy of his religious feeling. I will now quote what Dr. Muhlenberg says on this point:

"Nor, while he cultivated his mental and intellectual faculties, did he neglect to improve or cultivate the higher and moral principles of his heart. It is said, and that most truly, his moral excellence was equal to his intellectual. He was modest and humble, and hated the appearance of pride or ostentation in himself or in others. Under the cover of a plain, blunt, and somewhat repulsive exterior, he hid a warmth of affection, sincerity, and sensibility of feeling, known only to those who had the happiness of sharing his confidence and friendship. He was liberal, kind, and generous, willing and ready to embark in whatever he believed to be for the public good, not stopping to inquire how much he might have to sacrifice in order to attain the desired end: witness the efforts and personal sacrifice he made while conducting the *Mathematical Miscellany.* He gloried in the profession he had espoused, and labored nobly to make known the principles, and commend its object, purposes, and designs, to others. Above all, he was a devout man. The religion of the Bible, to him, was not a 'cunningly devised fable'; he had nothing of the pharisaical or supercilious views of the formal professor about him; he was meek and docile as a child, and had unshaken faith in the solemn verities of divine revelation. He united an unwavering faith with a profound and enlightened understanding; in a word, he was a learned and an accomplished scholar, an able mathematician, an excellent actuary, a worthy man, a humble believer, and a sincere Christian."

To this subject Dr. Muhlenberg, as was natural to one of his profession, devoted elsewhere most of his personal recollections of Gill.

Some of these may be stated. "He became a communicant of the Protestant Episcopal Church about twenty years before his death, so that I knew him long and intimately." "He was a humble believer in Christ; with his great intellect, he saw at once all the shallowness of scepticism and infidelity." "He read his Bible with the docility of a little child, at the same time making beautiful and discriminating observations, which often delighted me with their originality." "He was one of the many instances of the consistency of a religious faith with a profound and enlightened understanding."

Other recollections by Muhlenberg follow, who knew him long and intimately and speaks of him with the profoundest respect and affection. Gill's work as editor is thus described. "How amused I would sometimes be at the manner in which he dealt with the contributions of his correspondents, among them the foremost mathematicians of the country—much as a school-master does with the literary compositions of his boys, correcting and pruning them, and trimming them into shape. Sometimes a communication of several folio pages, after he had lopped it of what seemed redundancies to his eyes, and reduced it to a neat and compact form, would make but a leaf or a page in the *Miscellany*. Very often the authors could hardly have known their own work."

His literary taste was remarkable. "Mr. Gill had a refined taste in literature; wrote in chaste and forcible style himself, delighted in good works of fiction,—read Shakespeare with the spirit of a kindred soul. Indeed, the poetical element was a very strong one in his mental composition. In his working days he occasionally amused himself with writing verses. He lost no opportunity of cultivating a taste for the refined, elevating, and ennobling journalists of polite learning; he devoted not only a large portion of his own time to general literature, but he delighted to revel in the gorgeous and sublime imagery of poetry and the choicest works of fiction."

I am surprised to find it stated that "he was modest and humble." "He hated the appearance of pride in himself or in others." Humble has more than one meaning. That he did not like ostentation does not imply that he did not have a just and proper opinion of his own merits. A wise man like him knows how to place himself without showing himself ostentatious. I have quoted the word "repulsive" as applied to his demeanor. The word could be improved by changing "repulsive" to "repellent," in the two places

in which it is used. Muhlenberg himself would have accepted the correction if any one had suggested it while he was in the hurry of writing. Gill's manner in meeting a stranger may have been somewhat cold and repellent and this is all that I am willing to admit.

Benevolence and justice were marked traits in Gill's character. "To his intimate acquaintances he was a kind, loving and enthusiastic man." "A more honest man never lived. His keen sense of justice was never blunted by self-interest. Few have I known so much above the common infirmity of men, of viewing their neighbors' rights through one medium, and their own through another. In his moral perception the *tuum* was just as clear and distinct as the *meum*."

I have said enough about Muhlenberg's characterization of Gill. It is not only warm and affectionate, but fairly complete. I expected to have much to add to it, but it is satisfactory as it stands. Of course I adhere to my first opinion that Gill's chief traits were ambition and self-reliance.

GILL WAS A GENIUS.

The only new thing which I have to add, before finishing these papers, to the characterization of Gill is, that I have a firm belief that Gill had genius as distinguished from talent. Genius is marked by a vivid imagination. The capability of originating, which is a quality marked in most men of genius, is essentially the same thing as the power of imagination. Columbus was a genius, as was Kepler; so were also Lagrange and Laplace, Newton and Leibnitz, Shakespeare and all great poets. Gill had the power of imagination and origination. He might have been a poet, but was merely a mathematician.

APPENDIX F.

ACTUARY'S REPORT TO THE BOARD OF TRUSTEES OF THE MUTUAL LIFE INSURANCE COMPANY OF NEW YORK. EXHIBITING THE EXPERIENCE OF THE COMPANY DURING THE FIRST EIGHT YEARS OF ITS OPERATIONS, ACCOMPANIED BY REMARKS ON THE COMPARATIVE DURATION OF LIFE IN VARIOUS SECTIONS OF THE UNITED STATES AND CALIFORNIA. FEBRUARY, 1851.

REPORT TO THE BOARD OF TRUSTEES OF THE MUTUAL LIFE INSURANCE COMPANY OF NEW YORK.

GENTLEMEN:

In accordance with the instructions of a Committee of your body, on my appointment as Actuary of the Company, my attention has been chiefly directed during the past year, to a rigid examination of the experience of the Company from its commencement to the present time, so far as practicable; and especially with respect to the mortality among its members:—I beg leave to lay before you the results of this investigation, with a consideration of some practical consequences which it has suggested.

It should be premised that I have in all cases taken the assured age as the age of the individual; that is, if a party is assured at the age and rate of 30, I have supposed him to have completed his 30th year on the day of the date of his policy. I am aware that this is contrary to the practice of English Actuaries; but it must be remembered that the English Companies assure at "the age next birthday," so that if they were to take the assured age as the age of the party, they would make all their members older than they really are. This Company, on the contrary, assure at the age of the nearest birthday, and it is assumed that the errors in deficiency and in excess are equal and balance each other. At any rate I have little doubt that whatever be the amount of error introduced by this supposition, it is less than would probably arise from the additional complexity of calculation required by the attempt to graduate the ages more exactly.

My attention has been directed, in the first place, to the *Annual* Experience of the Company, by comparing, for each year, the actual number and amount of claims on the Company, with those that should have occurred according to the Table of Mortality on which its rates of premium are based. These results necessarily include all classes of assurers in the Company, as well the Northern as the Southern and Californian Risks. The comparison is therefore not strictly just; inasmuch as the mortality among those members to whom we charge an extra premium would be expected to exceed that among the members who pay the Tabular premium. As this subject will however be more fully discussed in the sequel, I submit the Table without further comment.

TABLE I.

OF THE ANNUAL EXPERIENCES OF THE MUTUAL LIFE INSURANCE COMPANY OF NEW YORK.

Years.	Probable Number of Claims.	Probable Amount of Claims.	Actual Number of Claims.	Actual Amount of Claims.
		Dollars.		Dollars.
Feb. 1, 1843 to Feb. 1, 1844	2.81	10902	0	0
" 1844 " " 1845	7.30	27120	5	18000
" 1845 " " 1846	14.78	51638	7	18100
" 1846 " " 1847	23.56	75858	23	69400
" 1847 " " 1848	31.86	100668	29	71150
" 1848 " " 1849	42.03	132464	27	94200
" 1849 " " 1850	53.75	164481	63	174950
" 1850 " " 1851	63.91	188957	*69	*143640
Total,	240.00	752088	223	589440

With a view to form a commencement of the Statistical History of the Company, I have tabulated and arranged the experience for the first complete seven years as far as the termination of those annual risks which commenced any time between Feb. 1st, 1849, and Feb. 1st, 1850, and ended at the corresponding date between Feb. 1st, 1850, and Feb. 1st, 1851, in six separate Tables, an abstract of which will be found at the end of the Report.

The first Table, marked "General Experience," gives the mortality that has occurred among all the assurers and annuitants in the Company, and furnishes a means of comparing the results with the corresponding ones of the Carlisle Table of Mortality; the second, marked "Class I," refers similarly to those members only who reside in the Eastern and Middle States; the third, or "Class II," to the residents of that section of the country, west of the Middle States, and north of the southern line of Virginia and Kentucky; the fourth, or "Class III," to those residing south of the preceding line and north of the 32nd parallel of latitude; the fifth, or "Class IV," to those residing south of the 32nd parallel of latitude; and the sixth, or "Class V," to those residing in California.

The Company makes no distinction in rates between the Classes I and II, but it was felt desirable to mark the effect of climate and circumstances in our newly settled Western States; to the assurers of Class III, we charge $\frac{1}{4}$ of one per cent. extra premium, and to those of Class IV, $\frac{1}{2}$ of one per cent.

From the comparatively small amount of data which they afford, the results of these Tables can be considered but of little value as an indication of the general statistics of the United States; yet as the first attempt, or rather beginning of attempt, to obtain reliable elements of Vital Statistics in this country, they are not without

* These numbers may possibly be increased by deaths yet to be heard of, occurring before the 1st of Feb. instant.

interest. But even in their present state they may be relied upon to some extent as a means of comparing the mortality in the different sections of the Union; since, other circumstances being the same, the differences exhibited can only arise from local causes.

The first thing that strikes us on a cursory glance at these Tables is the startling mortality among the California (Class V) risks. It is seen that the claims of this Class have been nearly six times as many as they should have been by the Table; in fact, the lives assured of this Class might, under ordinary circumstances, have been taken at the average age of 28, and at our regular rate of 2.24 per cent., while the claims occurring under these risks were such as, under ordinary circumstances, could only have resulted if their average age had been 70, and therefore their average annual premium should have been 14.93 per cent. That is, so far as our past experience can be taken as a guide, California risks should have been charged an annual extra premium of 12.69 per cent., in order to place them on an equality with other risks. In strict justice, however, the mortality of the several Classes should be compared, not with that of the community at large, as in the Carlisle Table, but with that of each other, or with that of a community *selected* under similar circumstances; which I now proceed to do.

The aggregate experience of Classes II and III are so nearly the same that it would seem necessary to place them on the same footing with respect to premium. There is, however, a great probability that the causes of excessive mortality in Class II will be ameliorated in a greater degree than in Class III, by causes actively operating in both. On the whole it would perhaps be unadvisable to increase the rates in Class II, and it must therefore be the combined experience of Classes I and II, on which our Tabular premiums are paid, with which we must compare that of the other Classes.

The aggregate mortality in Classes I and II, is .9481 per cent.; the mortality in Class III is 27.1 per cent. greater than this; and taking the average age of insuring in the United States at 37, this would lead to the conclusion that the premiums for Class III should be .786 per cent. greater than in Classes I and II; that is, we ought to charge an extra premium for this Class of $\frac{3}{4}$ of one per cent., instead of $\frac{1}{4}$ as we now do. The mortality in Class IV is 50.3 per cent. greater than Classes I and II, and it would thence follow that we should charge an extra premium for this Class of nearly $1\frac{1}{2}$ per cent. The mortality in Class V is 444.3 per cent. greater than that in Classes I and II, and it follows that the extra annual premium for this Class should be 13 per cent.; which amounts to the same as saying that lives in California in its present state are not insurable by any cautiously conducted office, and shows the prudence of the Trustees in discontinuing to underwrite these risks almost immediately after commencing.

It is not pretended that these results are infallible, or even that they are to form a basis on which the Company can at once pro-

ceed without hesitation;—to render them worthy of such confidence, many more years' experience must be combined with them. But two things may surely be predicated upon them with confidence:

1st, That the urgent solicitations of our agents and members at the South to discontinue the extra premium entirely, cannot be complied with, without doing great injustice to our Northern members, at least until further experience will justify such a course.

2nd, That no *extra* premiums for climate risks received by the Company can, with any degree of probability, be assumed as having hitherto contributed towards the profits, or surplus funds of the Company; and therefore that, in justice to those members who pay the regular table rates, these extra premiums ought not to participate in the profits or surplus. These funds should, in fact, be divided in proportion, not to the actual premium paid, but to the graduated Table rates of premium.

How does the rate of mortality in the Northern United States compare with that in England?

In order to furnish some slight means of answering this question, so vitally important to the Life Insurance Companies of this country, I have constructed the following Table, in which column A is the mortality per cent. in Classes I and II of this Company, derived from the preceding data; column B is the mortality per cent. during the *first year* of assurance among the lives assured in fifteen English companies of longest experience; column C is the mortality per cent. among all the lives assured in these companies extending through their whole experience to the close of the year 1837.

TABLE III.

Age.	A	B	C
25 to 35	.7433	.5884	.7910
35 to 45	.8533	.8872	1.1002
45 to 55	1.2512	1.3181	1.6140
55 to 65	2.8011	2.6755	2.9433
65 to 71	8.9802	3.4060	5.1769

Still bearing in mind that, from the comparative smallness of the data, the results of column A are not so reliable as those of columns B and C, if the mortality in the Northern United States were nearly equal to that in England, we should expect to find the numbers in column A somewhat greater than those in column B, but materially less than those in column C; and notwithstanding some inequalities, which might have been expected under the circumstances, they in general present such a type. They are not, however, so much smaller than the numbers in column C, as to authorise us to conclude, even if absolute reliance could be placed upon them, that the force of vitality in this portion of the United States is as great as it is in England among the same Class. At the same time the

results present, as yet, no reasonable cause of alarm to those Companies whose rates of assurance allow, as the rates of all Companies should do, a sufficiently large margin beyond the rates actually deduced from the English Tables of Mortality.

To those Companies, however, which, on the unwarrantable supposition that human life is better on this side of the Atlantic than in Europe, have made their rates equal to, and in some cases less than, those actually resulting from the Tables, not even allowing anything for the expenses of management, these results are a sufficient indication that, unless they change their rates, they must be ultimately unable to fulfil their contracts. One such Company pays its agents 10 per cent. commission on its premiums, and has actually made two annual dividends of 15 per cent. each; while its officers take credit to themselves before the public for the extreme "caution"! with which they have transacted their business. The rates of another Company are such that they must not only appropriate no part of their premiums to the management of their business, but they must invest every cent received for premiums and interest the moment it is due, at a higher rate of interest than six per cent., in order to have a possibility of paying their policies.

The same results show also the reckless course of those Mutual Life Companies which are making annual dividends of 40 and 50 per cent., or even more. To those Companies which use our rates of premium, and supposing the rate of mortality among assured lives here to ultimately approach that of the Carlisle Table, the net premium which must be used either at present or in future to fulfil their contracts of assurance is 75 per cent. of the premiums they receive; the expenses of management for a series of years cannot safely be estimated at less than 10 per cent. of the premiums, and there remains, then, as a *possible* surplus on which to declare dividends, 15 per cent. In the early years of a company, the effect of a careful selection of lives may increase this amount, although not to the extent usually imagined, as may be seen by comparing columns B and C of the preceding Table; and in after years there is a possible gain from investing at a higher rate of interest than that used in calculating the rates. But it is difficult to conceive a combination of circumstances that would justify a Life Company, charging our rates, in making annual dividends whose present value is more than 30 per cent. of the premiums received.*

There is one very startling fact exhibited in the preceding Table, to which I beg to call the attention of the Trustees. It will be seen that, although the aggregate mortality in Classes I and II of our Company (column A) between the ages of 35 and 55, is even less than that during the first year of assurance between these ages in the English Companies (column B); yet between 55 and 65 it is nearly equal to that in their extended experience (column C),

* The present value of the *reversionary* dividend of 52 per cent. made by this Company, on the 1st February, 1848, was about 24 per cent.

while above 65 it is nearly twice as great. This circumstance would not be so alarming taken by itself, inasmuch as the number of assurers above the age of 55 is not, in this country, sufficiently large to afford a fair average; but it happens that it is corroborated by the experience of the only other American Life Company whose affairs I have had the opportunity of investigating.

It is a well known result of all the European contributions to Vital Statistics, that a marked change, the causes of which are but very imperfectly understood, takes place in the Law of Mortality about the age of 55; so much so that Mr. Farr, in constructing the "English Life Table" for the Registrar-general, actually used different mathematical laws for the formation of his table before and after this age, and this period has been called the "break of life."

Can the marked increase of mortality above this age in this Company, partially corroborated as I have stated, arise from the circumstance that this important change in the force of Vitality at this period, may arise from the same causes, *acting with greater intensity in the Northern United States, than in England?* The gravity of this question, and the importance of as speedily as possible getting a correct answer to it, will be clearly seen when it is stated that the price of any Life Benefit at any age, as 30, depends for its value on the rate of mortality at all the ages *above* that age. Would it not be possible to take the next census of the State of New York, in such a way as, at least, to determine this point?

Apart from this consideration, however, there are others which need only be glanced at, that render it inexpedient, in my opinion, for any Company in this Country to assure lives above the age of 55. Few wish to assure above that age:—of the 9308 policies issued by this Company to Feb 1st, 1851, but 176 were on lives above the age of 55; while, to make a fair average of the latter class, they should not be much less than one-fourth of the whole. At and above this age the hereditary experience of the party's family becomes an element of much weight as to his future longevity, an element in the consideration of which the applicant has all the advantage of the Company. I have before had occasion to mention that the rates of assurance of this Company above the age of 55, are too small when compared with the rates below that age; for instance, the rate at 67 is 9.45 per cent., while calculated on the same principles as the rates for ages below 55, it should be 10.32 per cent.

These considerations induce me to recommend the Trustees to confine their assurance business, so far as the issuing of new policies is concerned, to lives below the age of 56.

C. GILL, *Actuary.*

New York, Feb. 11, 1851.

TABLE II.

Abstract of the Experience of the Mutual Life Insurance Company of New York

From the commencement of the Company, February 1st, 1843, to February 1st, 1851, excluding the unexpired fractions of those Policies, whose annual risks commenced between February 1st, 1850 and February 1st, 1851.

Age.	General Experience.					Class I.					Class II.				
	Number of Lives Which Commenced Any Year of Age Between the Ages Opposite.	Number Who Died Before Completing That Age.	Number of Probable Deaths by the Carlisle Table.	Actual Mortality, Per Cent.	Probable Mortality, Per Cent. by Carlisle Table.	Number of Lives Which Commenced Any Year of Age Between the Ages Opposite.	Number Who Died Before Completing That Age.	Number of Probable Deaths by the Carlisle Table.	Actual Mortality, Per Cent.	Probable Mortality, Per Cent. by Carlisle Table.	Number of Lives Which Commenced Any Year of Age Between the Ages Opposite.	Number Who Died Before Completing That Age.	Number of Probable Deaths by the Carlisle Table.	Actual Mortality, Per Cent.	Probable Mortality, Per Cent. by Carlisle Table.
Under 15	13.	0	.070	0.	0.5385	13.		.070	0.	0.5385					
15 to 25	822.9	13	5.774	1.5676	0.7017	605.6	4	4.247	0.6605	0.7011	43.6		.307	0.	0.7040
25 to 35	6510.	64	61.433	0.9831	0.9437	4597.4	34	43.346	0.7395	0.9428	918.4	7	8.784	0.7622	0.9564
35 to 45	6888.3	61	84.215	0.8855	1.2226	4754.1	37	58.157	0.7783	1.2233	1105.8	13	13.516	1.1756	1.2223
45 to 55	2682.	38	39.152	1.4168	1.4598	1932.2	23	28.232	1.1904	1.4611	385.6	6	5.599	1.5560	1.4520
55 to 65	545.8	18	13.645	3.2979	2.5000	403.1	10	10.063	2.4808	2.4964	61.	3	1.598	4.9180	2.6197
65 to 75	50.4	4	2.378	7.9365	4.7182	41.4	3	1.991	7.2464	4.8092	7.	1	.299	14.2857	4.2714
Above 74	4.	0	.630	0.	15.7500	4.		.631	0.	15.7500					
Total	17516.4	198	207.297	1.1304	1.1834	12350.8	111	146.738	0.8987	1.1852	2521.4	30	30.103	1.1898	1.1939
	Class III.					Class IV.					Class V.				
Under 15															
15 to 25	16.	1	.113	6.25	0.7050	9.		.063	0.	0.7	141.6	7	1.002	4.9435	0.7076
25 to 35	356.7	3	3.378	0.8410	0.9470	331.4	8	3.161	2.4140	0.9538	223.4	11	2.026	4.9239	0.9070
35 to 45	404.3	2	4.953	0.4947	1.2251	404.4	5	4.974	1.2364	1.2299	111.2	4	1.308	3.5971	1.1763
45 to 55	179.8	2	2.632	1.1123	1.4638	135.5		1.976	0.	1.4584	25.6	4	.371	15.6250	1.4492
55 to 65	38.8	4	.939	10.3092	2.4201	31.9		.762	0.	2.3887	2.		.037	0.	1.8500
65 to 75															
Above 74															
Total	995.6	12	12.015	1.2053	1.2068	912.2	13	10.936	1.4251	1.1988	503.8	26	4.744	5.1608	0.9416

APPENDIX G.

On the Determination of Surplus.

To the Editors of the Assurance Magazine.

Gentlemen,—I have been very much gratified with the article in the *Assurance Magazine* on the Determination of the Surplus of a Life Assurance Company. It may perhaps interest some one to see the process which I have used for the same purpose.

It should be premised that it is the practice in the American Companies to assure at the age of the nearest birthday, so that no material error can arise from assuming the day of the date of the policy as the birthday of the party assured.

In the first place, I arrange the policies according to the year of birth, as in the article referred to, but grouping them according to the age at which they were assured, and the consequent premium paid: thus—

Born in the year ——.

Assured at the age x; premium for £1, p_x.

No. of Policy.	Date of Policy.	Decimal of a Year to Jan. 1.	Sum Assured.	Product of the Two Columns.
——	——	t_1	A_1	A_1t_1
——	——	t_2	A_2	A_2t_2
		&c.	&c.	&c.
		Σt_1	ΣA_1	ΣA_1t_1
Assured at the age $x+1$; premium for £1, p_{x+1}.				
——	——	t_1'	A_1'	$A_1't_1'$
——	——	t_2'	A_2'	$A_2't_2'$
		&c.	&c.	&c.
		$\Sigma t_1'$	$\Sigma A_1'$	$\Sigma A_1't_1'$
		$\int$	$\int\Sigma A_1$	$\int\Sigma A_1t_1$

I here suppose the balance-sheet to be required for January 1st: if it is for any other date, the decimal of the year is taken from the date of the policy to that date; the column being easily filled up from a table previously prepared. The products (A_1t_1) I calculate to the nearest dollar; perhaps for the pound sterling they had better be calculated to tenths.*

Now, let V_{x+n} be the present value of £1 payable at death, at the age $x+n$; a_{x+n} the present value of an annuity of £1 at the same

* It should be remembered that the columns t_1 and A_1t_1 are constant while the policy is in force, the footings only having to be corrected from year to year as the policies lapse.

age. Then the present value of the first policy at the last birthday is A_1V_{x+n}; at the next birthday it is A_1V_{x+n+1}; and on the 1st January it is

$$A_1V_{x+n} + A_1t_1(V_{x+n+1} - V_{x+n}).$$

The value of the second policy, January 1st, is

$$A_2V_{x+n} + A_2t_2(V_{x+n+1} - V_{x+n}), \text{ \&c.}$$

The value of all the sums assured at the age x is

$$V = V_{x+n}\Sigma A_1 + (V_{x+n+1} - V_{x+n})\Sigma A_1t_1;$$

and the value of all the sums assured of those born in the same year is, on 1st January,

$$\int V = V_{x+n}\int \Sigma A_1 + (V_{x+n+1} - V_{x+n})\int \Sigma A_1t_1.$$

It will be observed that the only difference in the labour of obtaining this true value, and an approximate one, is that employed in filling the columns for t_1 and A_1t_1,—a labour which requires no repetition. If the third column had indicated the exact day of birth, the result would have been mathematically exact.

Again, the present value of the future payments, after the last payment was made on the first policy, was $A_1p_xa_{x+n}$; immediately before the next payment is made, it will be $A_1p_x(1 + a_{x+n+1})$; and on the 1st January it is

$$A_1p_xa_{x+n} + A_1t_1p_x(1 + a_{x+n+1} - a_{x+n}).$$

The value of the future payments on the second policy, January 1st, is

$$A_2p_xa_{x+n} + A_2t_2p_x(1 + a_{x+n+1} - a_{x+n}), \text{ \&c.}$$

The present value, January 1st, of the future premiums on all the policies issued at the age x, on lives born in the year ——, is

$$v = a_{x+n}p_x\Sigma A_1 + (1 + a_{x+n+1} - a_{x+n})p_x\Sigma A_1t_1.$$

The corresponding value for those issued at the age $x + 1$ is

$$v' = a_{x+n}p_{x+1}\Sigma A_1' + (1 + a_{x+n+1} - a_{x+n})p_{x+1}\Sigma A_1't_1', \text{ \&c.}$$

The sum of all these values is

$$\int v = a_{x+n}\int p_x\Sigma A_1 + (1 + a_{x+n+1} - a_{x+n})\int p_x\Sigma A_1t_1.$$

I use the true values of V_x and p_x, and apply an appropriate "loading" to $\int V$ and $\int v$, the amount of which must depend on the

nature of the risks, and must be estimated for each particular Company.

I have pointed out how the exact value of all the sums assured may be obtained, when the system of assurance is such that the date of the policy cannot be taken for the date of birth. For the present value of the future payments in such cases, the exact formula is more complicated, inasmuch as both dates must be elements of the calculation. I have no doubt, however, that a formula may be obtained by which this value may be approximated to within strictly defined limits.

I ought to mention that I have found the columns t and At very useful in estimating the probable mortality in a Company in a financial year.

Your obedient Servant,
C. GILL.

Mutual Life Assurance Company,
New York, June 1851.

[NOTE.—In our article on this subject, we strongly insisted on the very small difference arising between the results of a class valuation, and one in which each policy has been separately valued. The following remarkable confirmation of this has been handed to us by a friend. It occurred in a Company in which the sums assured amounted to £2,689,719, and the annual premiums to £81,225.

	£
Value of the sums assured, each policy being separately valued .	1,576,411
Do. of future premiums, do. do. .	902,553
	£673,858
	£
Value of the sums assured, the policies being valued in classes .	1,576,521
Do. of future premiums, do. do. .	902,839
	£673,682
Difference . .	£176

The arrangement pointed out in our correspondent's letter is highly ingenious, and would no doubt meet the exigencies of the case; but the additional labour would be considerable, inasmuch as the column A_1t_1 *would have* to be calculated afresh at each valuation, on account of the bonus additions,—a circumstance which appears to have escaped our correspondent's observation.—ED. *A.M.*]

APPENDIX H.

Second Mortuary Report.

To the Board of Trustees of the Mutual Life Insurance Company of New-York.

Gentlemen:

I beg leave to present to you the results of my investigation of the extended experience of the Company, comprising two years more than that contained in my former Report of February 11th, 1851.

TABLE I. (2.)

Of the annual experiences of the Mutual Life Insurance Company of New-York.

Years, Terminating Feb'y 1st.	Actual.		Probable, by the Carlisle Life Table.		Probable, by the Company's Life Table.	
	Number of Claims.	Amount of Claims.	Number of Claims.	Amount of Claims.	Number of Claims.	Amount of Claims.
1844	0	0	2.81	10902	2.96	11461
1845	5	18000	7.30	27120	7.72	29703
1846	7	18100	14.78	51638	15.55	54530
1847	23	69400	23.56	75858	24.96	80485
1848	29	71150	31.86	100668	33.67	107017
1849	27	94200	42.03	132464	44.37	140495
1850	63	174950	53.75	164481	56.81	174608
1851	71	154640	63.91	188957	67.61	200827
1852	50	166600	68.27	200856	72.48	214350
1853	68	206100	71.95	214479	76.56	229729
Total.	343	973140	380.22	1167423	402.69	1243205

It is seen that, although the actual number of deaths, when compared with the probable, is somewhat less during the two last years, than in the eight preceding, as indeed might be expected, since the latter included the cholera year of 1849, and the extraordinary mortality in California; yet the actual amount of claims, when compared with the probable, is somewhat greater.

I have farther carried out and tabulated (see Table II. (2.)) the mortuary history of the Company, in the five different sections of country, over which nearly all its risks are scattered, for the nine complete years of its existence, as far as the termination of those annual risks which commenced any time between the 1st February, 1851, and 1st February, 1852, and terminated at the corresponding dates between February 1st, 1852, and February 1st, 1853, as explained in my previous Report, pages 4 and 5.

Perhaps it will facilitate the comparison of the recent mortality in the different sections with that exhibited in the previous Report, if the total mortality per cent. in each section during these two periods is shown thus:

TABLE III.

	Before 1851.	Since 1851.	Whole Time.
In the whole Company,.....	1.1304	1.0309	1.0917
" Class I. (1,).....	0.8987	0.8831	0.8928
" Class II. (2,).....	1.1898	0.9193	1.0716
" Class III. (3,).....	1.2053	1.3940	1.2743
" Class IV. (4,).....	1.4251	1.8907	1.5960
" Class V. (5,).....	5.1608	3.0783	4.2968

(1.) Class I. includes those members residing in the Eastern and Middle States; as also the States of Maryland and Virginia.
(2.) Class II. those residing west of the former, and bounded south by the southern line of Kentucky and Missouri.
(3.) Class III. those residing south of the former line, and north of the 32d parallel of latitude.
(4.) Class IV. those residing south of the 32d parallel of latitude.
(5.) Class V. those residing in California.

It will thus be seen that, although the mortality in classes I. II. and V. as well as in the whole Company, has been less since 1851 than before that period, yet in classes III. and IV. it has been greater, and to an extent somewhat alarming.

Without repeating a course of reasoning similar to that in pages 6 and 7 of the preceding report, it is sufficiently obvious that the Trustees are more than justified in having, at the late distribution, excluded the small extra premiums received from members of these classes, from all participation in the surplus funds. Indeed, it becomes a grave question, whether the Company can, in justice to their other members, underwrite future risks in those sections of Country, at the rates heretofore charged.

The most gratifying feature in these results, is that exhibited in Class II.; the approximation of the mortality in that section, to that in Class I. strengthens the probability I ventured to predict in my first report, that the Trustees will be justified in continuing the benefits of their Institution to those great and growing States, on the same terms as to their other Northern members.

C. GILL,
Actuary.

NEW-YORK, May 9th, 1853.

TABLE II. (2.)

ABSTRACT OF THE EXPERIENCE OF THE MUTUAL LIFE INSURANCE COMPANY OF NEW-YORK,

From the commencement of the Company, February 1st, 1843, to February 1st, 1853; excluding the fractions of Policies whose annual risk commenced between February 1st, 1852, and February 1st, 1853.

Age.	General Experience.					Class I					Class II.				
	Number of Lives Which Commenced Any Year of Age Between the Agrs Opposite.	Number who Died Before Completing That Age.	Actual Mortality, Per Cent.	Probable Mortality, Per Cent. by the Carlisle Table.	Probable Mortality, Per Cent. by the Comp's Life Table.	Number of Lives Which Commenced Any Year of Age Between the Ages Opposite.	Number Who Died Before Completing That Age.	Actual Mortality, Per Cent.	Probable Mortality, Per Cent. by the Carlisle Table.	Probable Mortality, Per Cent. by the Comp's Life Table.	Number of Lives Which Commenced Any Year of Age Between the Ages Opposite.	Number Who Died Before Completing That Age.	Actual Mortality, Per Cent.	Probable Mortality, Per Cent. by the Carlisle Table.	Probable Mortality, Per Cent. by the Comp's Life Table.
Under 15	15.	0	0.	0.5333	0.6333	15.	0	0.	0.5333	0.6333					
15 to 25	1264.4	16	1.2654	0.7017	0.7556	930.4	6	0.6449	0.7019	0.7599	99.8	0	0.	0.7034	0.7705
25 to 35	10190.4	94	0.9224	0.9461	0.9520	7109.6	49	0.6892	0.9439	0.9503	1543.5	13	0.8422	0.9544	0.9590
35 to 45	11442.8	106	0.9263	1.2275	1.2377	7745.1	59	0.7618	1.2274	1.2361	1994.5	20	1.0027	1.2252	1.2321
45 to 55	4676.1	63	1.3472	1.4598	1.7496	3330.1	41	1.2312	1.4601	1.7446	712.8	9	1.2626	1.4554	1.7523
55 to 65	986.9	27	2.7358	2.5261	2.8737	726.9	18	2.4763	2.5380	2.8706	116.8	4	3.4246	2.5478	2.9074
65 to 75	86.1	6	6.9686	4.7863	5.5877	70.1	4	5.7061	4.8716	5.6876	12.	2	16.6667	4.3667	5.5000
Above 74	10.	1	10.	14.8200	16.5600	10.	1	10.	14.8200	16.5600					
Total	28671.7	313	1.0917	1.2019	1.2720	19937.2	178	0.8928	1.2074	1.2794	4479.4	48	1.0716	1.1998	1.2645
	Class III.					Class IV.					Class V.				
Under 15															
15 to 25	23.4	2	8.5470	0.7051	0.7478	12.3	0	0.	0.7073	0.7805	187.8	7	3.7274	0.7039	0.7577
25 to 35	543.9	3	.5516	0.9570	0.9441	477.8	10	2.0929	0.9628	0.9709	401.2	17	4.2373	0.9093	0.9294
35 to 45	649.9	8	1.2309	1.2318	1.2386	664.1	11	1.7078	1.2781	1.2789	210.2	8	3.8059	1.1874	1.2093
45 to 55	291.	3	1.0309	1.4660	1.7660	232.	2	0.8621	1.4689	1.7383	55.9	5	8.9445	1.4454	1.7710
55 to 65	61.3	4	6.5253	2.3017	2.7732	54.9	0	0.	2.5427	2.8706	6.	0	0.	1.9734	2.5500
65 to 75															
Above 74															
Total	1569.5	20	1.2743	1.2139	1.2874	1441.1	23	1.5960	12.356	1.2888	861.1	37	4.2968	0.9745	1.0262

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